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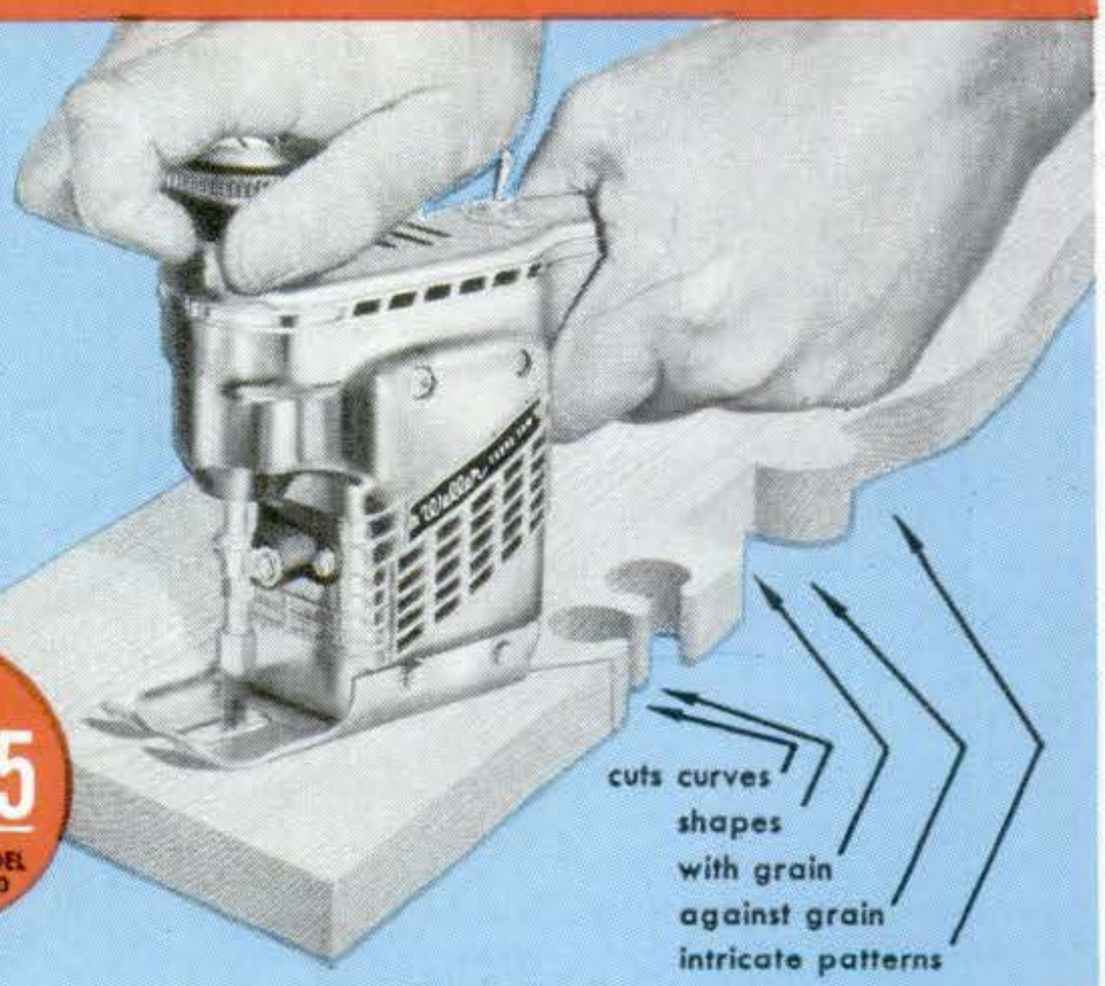

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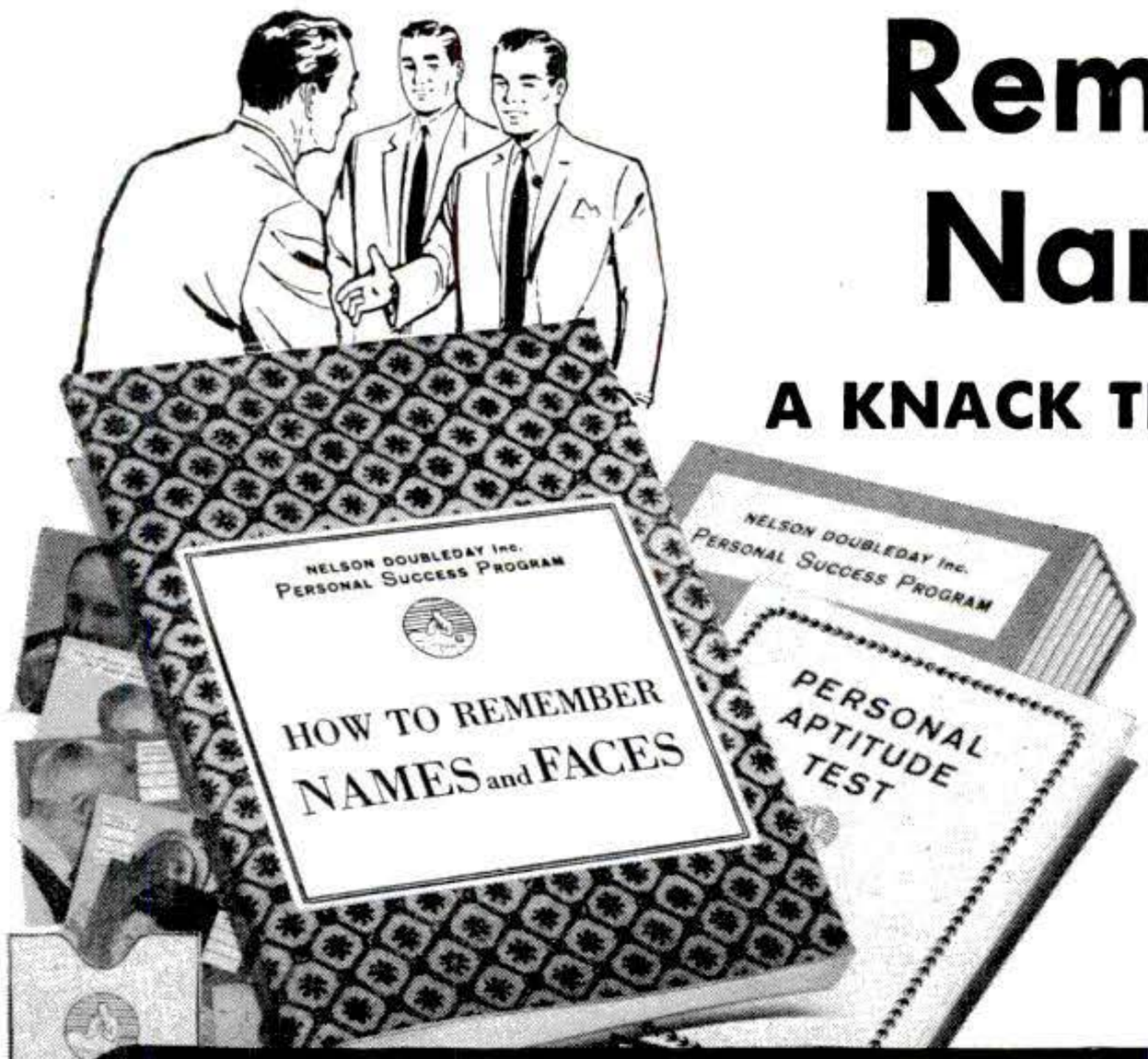

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An expert memory is easy when you know the secrets of professional memory experts! With this revolutionary new Self-Training Kit, you can actually increase your "memory power" up to 500% in a few weeks! Kit consists of streamlined instructor manual, plus unique pocket set of practice and application cards which you can use inconspicuously at odd moments anywhere. Simple, yet scientific — you'll be amazed at the results! And it's yours virtually as a gift!

This Complete Rapid Memory Trainer Kit yours for only 10¢ including FREE Personal Aptitude Test — Total Value $3.00

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The Most Practical, Far Reaching Plan Ever Devised to Help Men Increase Their Earning Power and Enjoy the Good Things of Life!

MONTH by month . . . step by step . . . this brand new Nelson Doubleday Personal Success Program shows you how to develop the personal skills and techniques that pave the way to advancement . . . in any field!

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Look at some of the highest paid men in business. They have developed the basic abilities that always pay off . . . the ability to handle people . . . to speak and write effectively . . . to create ideas and "sell" them to others . . . to organize their time efficiently and achieve more. They have learned to understand business procedures . . . what to read to keep well informed . . . how to win important new friends wherever they go. And they are just naturally sought out by others whenever a responsible job is to be done.

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To acquaint yourself with the advantages offered by the Personal Success Program, accept this unusual "sample" offer. There is no obligation. If you are delighted with your first self-training kit and wish to continue with the Program, you will receive a new Progress Kit each month, for which you will pay, not the many dollars that most courses on these subjects would cost, but only $1, plus small shipping cost. There is no minimum purchase requirement, and you may stop whenever you like. Mail the coupon today. No salesman will call. The Nelson Doubleday Personal Success Program, Garden City, N. Y.

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After examining this package, I will decide whether or not I wish to continue. If not, I will simply let you know. If I do continue, you will send me a "Personal Success Kit" each month for only $1 plus shipping. As I collect my progress kits, you will send me FREE a handsome desk-top file (pictured above) in which to store them. I am not obligated to take any minimum number of kits, and I am free to stop at any time.

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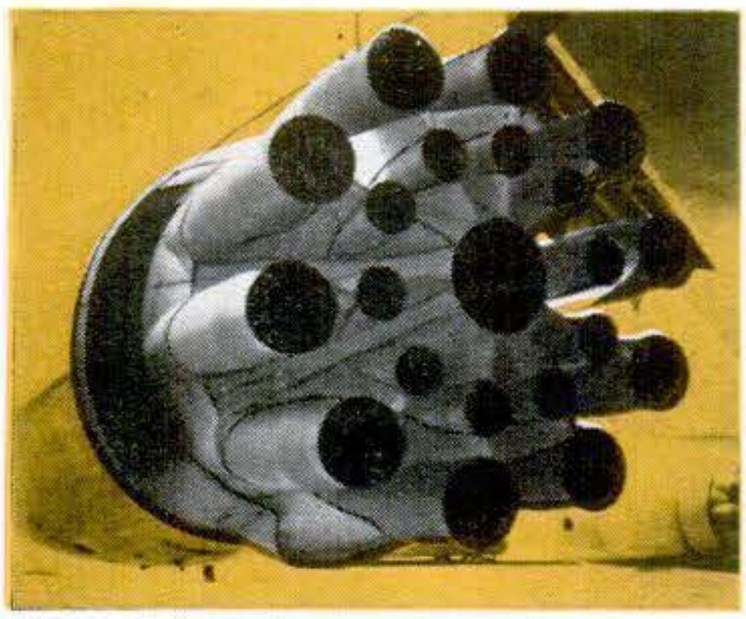
Popular Science Monthly

November, 1958



Will jet airliners blast the peace of your community? Engineers hope this gizmo will hush them.

What you should know before you buy a new TV—complete with specs.

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Expert advice on how to use that new marvel: Pushbutton Painting.

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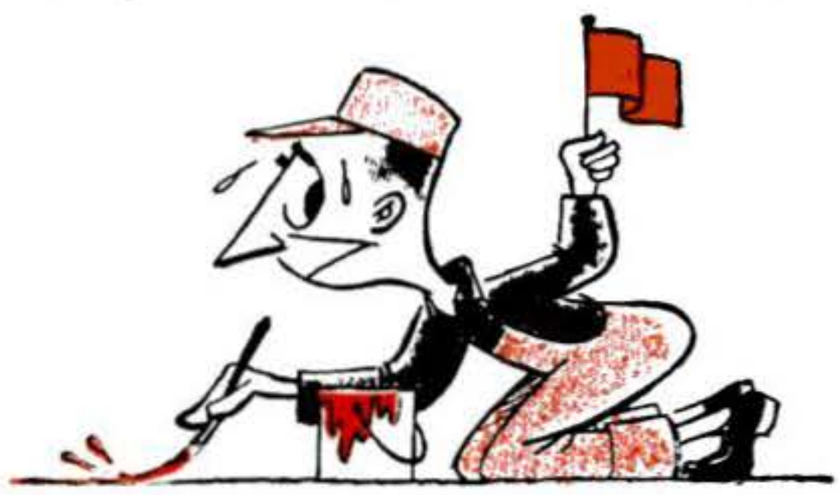
PS Readers

TALK BACK

Hard Look Wins Cheers

DISCUSSING highways with inadequate right-hand shoulders ["A Safety Expert Looks at Turnpikes," July], Paul Kearney whammed into Massachusetts. Hitting us head on, he tagged our pike "an outstanding offender," then got in a few sideswipes: "The shoulder is the same color and material as the driving lanes . . . only demarcation is a solid white



stripe . . . strangers commonly mistake the shoulder for a driving lane."

Could be his article had a happy result. At any rate, a yellow line has now been painted on the road to distinguish the lane for disabled cars.

JOHN CURRIE JR., Dedham, Mass.

Rambler Depreciates Less—Not More

THAT was a fine job you did in explaining when to trade your car [Aug.]. It's just what I've been telling tightfisted customers for years (I'm an auto salesman).

But you're way off base on one point. That's where you say "Some experts would put both Rambler and Scotsman in a separate rate class, to be traded sooner than cars in the Big Three." Who were those experts—press agents for the Big Three?

Actually, the trade-in value of a Rambler six now holds up better than that of comparable Big Three sixes. At the time your article appeared a three-year-old Rambler six sedan was worth $25 to $100 *more* than its opposite number among the Big Three. This despite the fact that the original price was lower.

TOM S. THORNE, Caldwell, N.J.

The used-car price guides back you up. Our sources were recognized independent authorities in this field (and no relation to any automobile makers), but they were wrong.

. . . Author Lindsay's faith in the Runzheimer-Howard recommendations for car trading is touching. Sure that an engineer and a mathematician can't steer you wrong, he regrets keeping a '51 Plymouth until 1957. Why? Because in 1956 his combined depreciation and repairs was $457, whereas in 1957 it was $479.

But isn't $479 less than the $800 depreciation during first-year ownership of a new car? Isn't it less than the $593 depreciation-repair bill he'll pay in his second year, or the $515 and $487 for his third and fourth year?

I'd say that when depreciation-repair threatens to overtake the $800 of first-year depreciation, *then* you've reached the economically justifiable trade-in point. But we all seek plausible reasons for treating ourselves to a new car.

ARTHUR CLIFFORD, Carpinteria, Cal.

Author Lindsay's point was that driving his 1951 Plymouth in 1956 and 1957 cost him virtually as much, adding depreciation and repairs, as it had in 1955. Hence, although he was now driving a car five and six years old, he had saved no money by keeping it beyond four years.

Booklet Has Psychological Sock

YOUR July tear-out booklet ["What to Do If You Have an Auto Accident"] is extremely well compiled and quite to the point. Besides providing valuable infor-

mation on procedure after an accident, it brings to mind the seriousness and ultimate high cost of car accidents.

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Now you're the "Dad"—and that's *your* kid looking up at you.

You're a hero in his eyes. You *know* that. But how do you look in your own eyes? Are you using your abilities to build a secure future for your family — to give them the good living and advantages that could be theirs? Maybe you lost a few years in military service — or a lack of formal education has shut you out of the big-pay jobs that could be yours.

So, you're trying to fit into a job that's too small for you.

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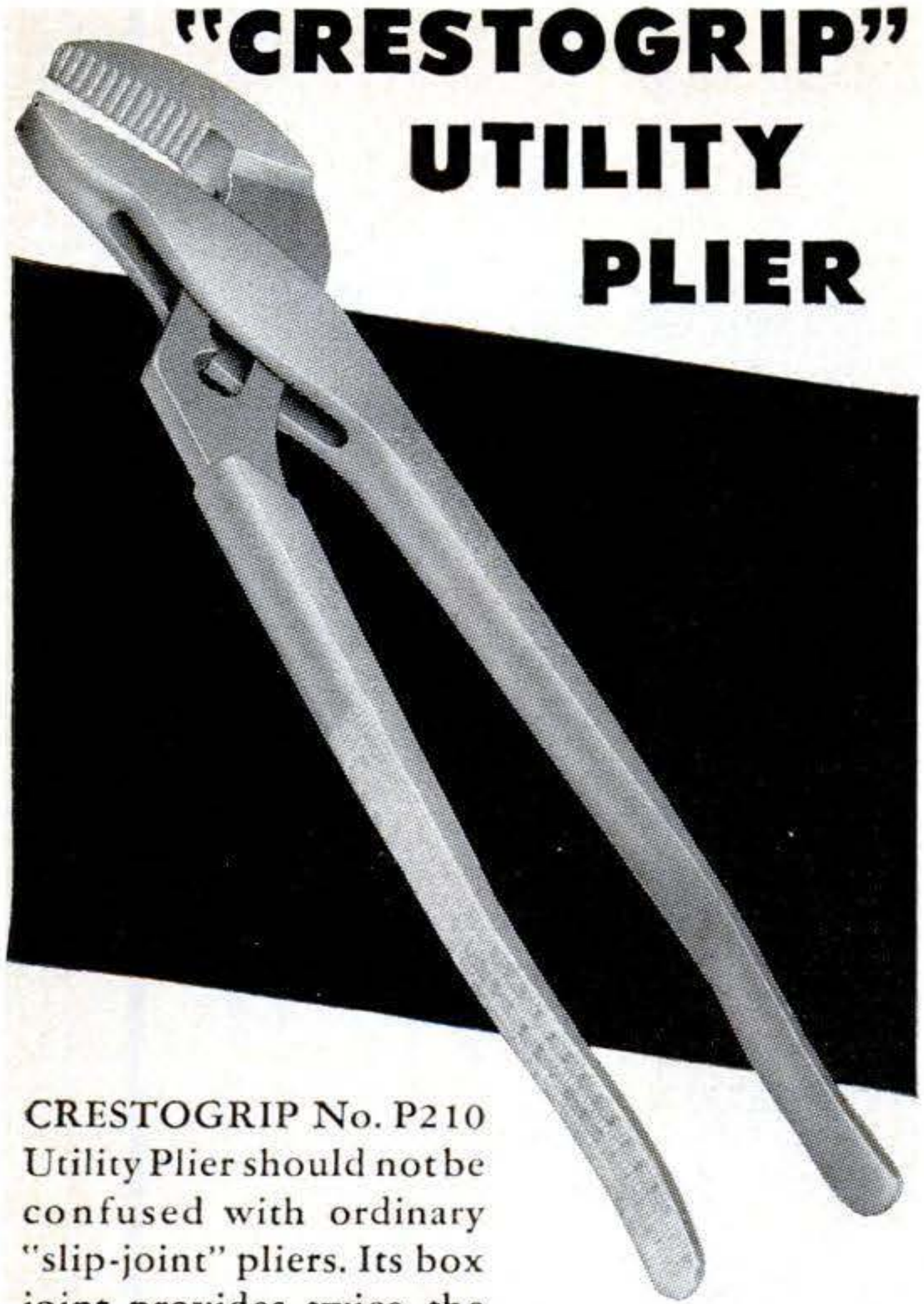

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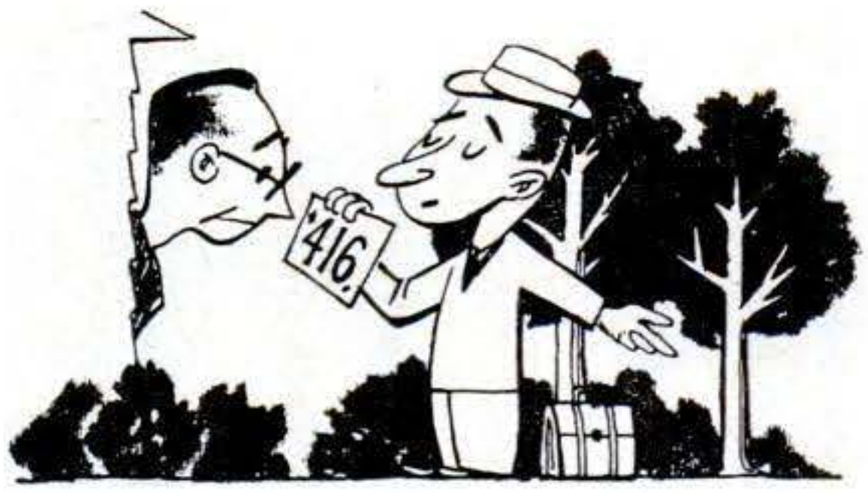
throughout Washington, Idaho and Montana, and we'd like every one of them to read the booklet. It is our feeling that any information or literature that tends to cut down accidents will be of great benefit to many communities and result in fewer claims from accidents created by both company and personal cars.

GEORGE A. GEHR, Safety Director, General Telephone Co., Seattle.

They Done Him Wrong!

WE MUST have a different way of doing things in Florida ["If the Highway Builders Want Your Home," July]. I was of-



fered less than the actual cost of property taken for widening U.S. Highway 1.

No one came in "to talk things over." The State simply offered me $416—which I refused—for fully sodded front lawn 35 feet in depth, planted with 24 shade trees. Furthermore, I was stuck with a loan commitment that was lowered $2,500 after the road was built and thus unable to sell the house except at a loss.

All this happened two years ago, and so far no settlement has been made, nor have they tried to make one. As for expert real-estate men to appraise property, I don't know what they are expert at, but I am sure it is not real estate.

R. F. BROWDER, Ormond Beach, Fla.

Applause from the Highway Patrol

THE fine article, "How to Defend Yourself on the Highway" [Sept.], evoked lots of favorable comment from many members of the Patrol. The interest of POPULAR SCIENCE in the unending struggle to reduce traffic accidents is very much appreciated.

B. R. CALDWELL, Commissioner, Cal. Highway Patrol, Sacramento.

Runner Crosses Up the Doctor

I SEE by the papers that on August 6th Australia's wonder runner Herb Elliott

[Continued on page 10]

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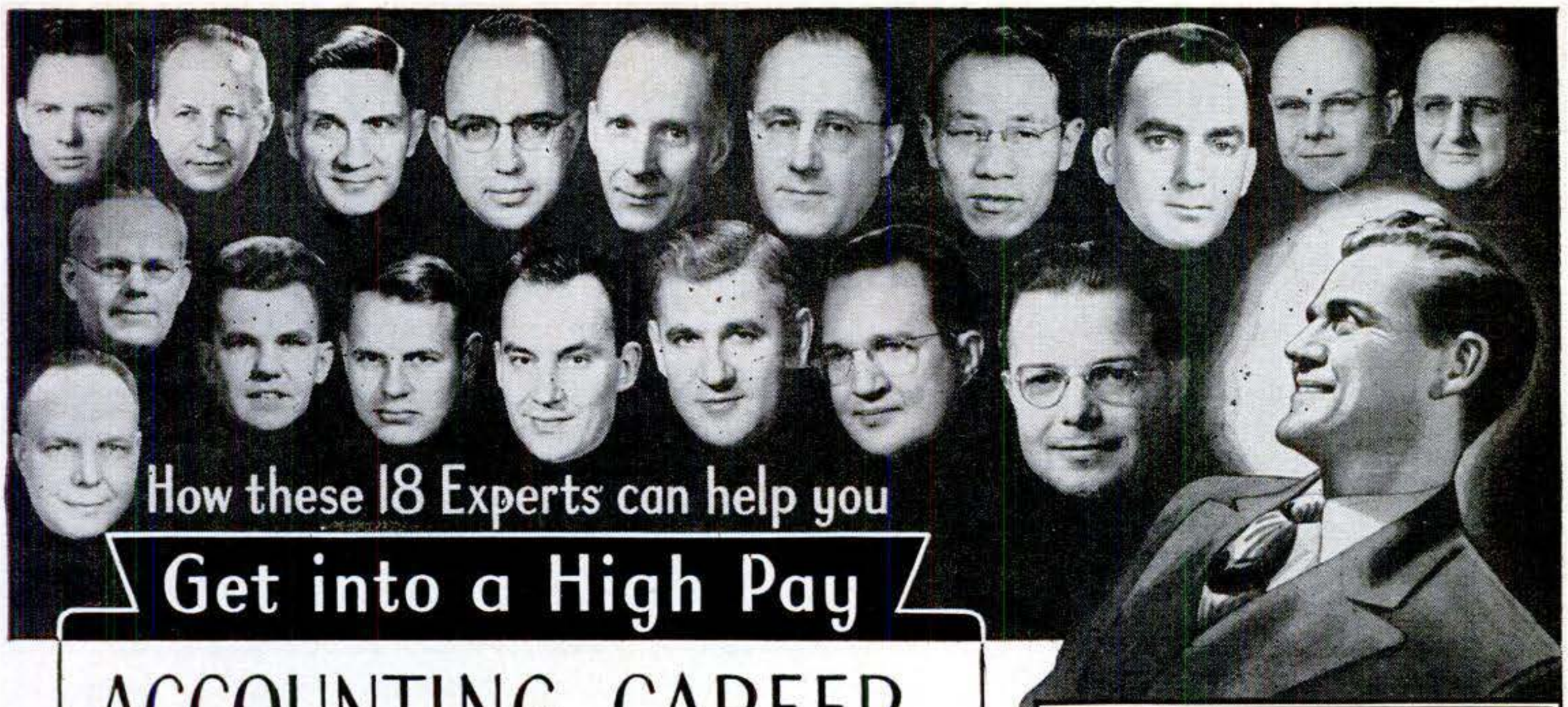

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THORESEN'S MILLION DOLLAR

THORESEN UNDERSUIT

Insulated with Curtiss-Wright's CURON

LIST PRICE $39.95

11.88

Keeps You Warmer Even in 72 DEGREES Below Freezing!

New 1959 Thoresen Undersuit with amazing Curon that OUTWARMS, OUTWEARS and OUTDATES all other insulated undersuits on the market—even those that cost up to THREE TIMES MORE!

You've read about the wonders of Curon in magazines and newspapers . . . you've seen its superiorities demonstrated on television . . . you've heard leading commentators talk about it on radio . . . now famous THORESEN'S, for the very first time, offers you its premium-quality Undersuit fully insulated with miracle new Curon at a BIG DISCOUNT! List price: $39.95 . . . Thoresen cuts price to $11.88.

Developed by the famed Curtiss-Wright Research Laboratories at a cost of thousands of dollars, Curon is lighter than wool, lighter than alpaca, lighter than down, lighter than lambs wool, lighter than sheep wool, lighter than nylon, dacron and other synthetic materials — YET WARMER THAN ALL OF THEM! Your Warm-Air Undersuit with Curon weighs only ounces yet gives same protection as 20 lbs. of heavy garments! Featherweight. Move about freely in it. No itch. No bulk. Shrinkproof. It can be washed, scrubbed, rubbed, dry cleaned, pressed, steamed. Never loses its shape. Won't mat or bunch or stretch. Can be worn in normal room temperature without sweating by Hunters, Truckers, Police Officers, Letter Carriers, Outdoor Workers. Great for men over 35. Keeps you nice and warm in cold, damp weather —YET YOU WEAR LESS OUTER GARMENTS!

Sizes: Small (36-38); Medium (40-42); Large (44-46); Extra Large (48-50).

No. 350 . . . . . $11.88

Deluxe Model with zipper openings, special dina-stitching, only $2 more.

No. 350-D $13.88

THORESEN, Inc., Dept. 7-M
585 WATER STREET
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Curon gives you LESS WEIGHT...LESS BULK . . . BETTER FASHION . . . GREATER COMFORT . . . LONGER LIFE—the 5 advantages every sportsman, every hunter wants in his insulated undersuit!

Curon weighs only half as much as the finest quilted synthetic interlining YET STOPS MORE COLD... keeps you far warmer even in 72 degrees below freezing! Curon is a full 35% more effective as an insulator than the finest animal-fibre-textiles that weigh up to FIVE TIMES AS MUCH! In damp and moist cold the insulating superiority of Curon is even more pronounced.

Curon is so soft and pliable that you can easily squeeze a full square yard to the size of a tennis ball . . . release it and Curon literally flows back to its original shape. The fashion built into the garment will always remain there!

This Insulated Vest Feels Warmer than 5 Sweaters!

Insulated with Curtiss-Wright's CURON

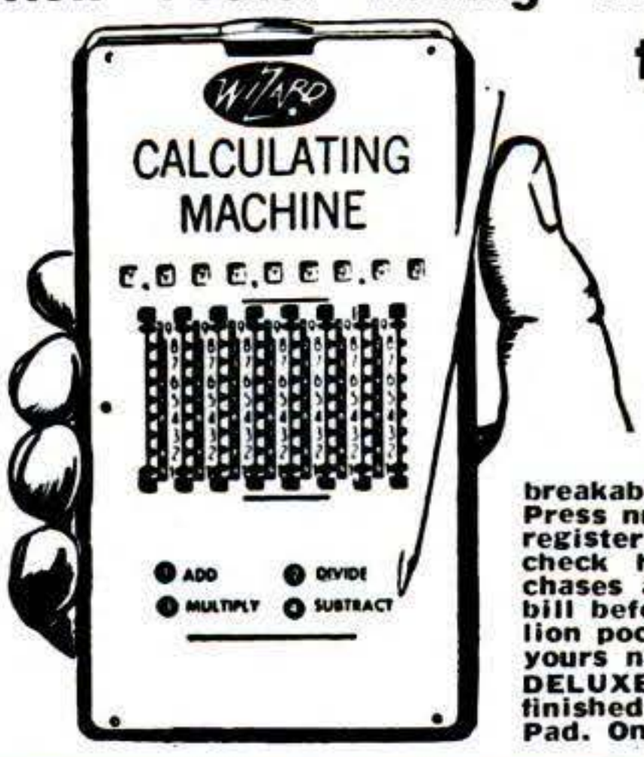
5.77

Made to Sell for $12.95

FREE Home Trial

New 1959 hunting vest with genuine CURON INSULATION for extra warmth and protection—made to retail for $12.95 in better sporting goods stores everywhere—yours for only $5.77 direct! Feather-light yet warmer than 5 wool sweaters, say many wearers. Extra-large non-rust Zipper that won't freeze. Two huge roomy pockets with inside ELASTIC SHELL LOOPS. Washable. Dries Fast. Keeps shape. Curon insulation by world-famous Curtiss-Wright. Dustproof. Mothproof. Full purchase price refunded if you don't agree it's easily worth TWICE THE PRICE WE ASK! RED, BROWN or YELLOW. Extra Small (32-34); Small (36-38); Medium (40-42); Large (44-46); Extra Large (48-50). No. 53 . . . . Slashed to only $5.77

New Pocket Adding Machine Adds & Subtracts to ONE BILLION!



★ 100% Accurate
★ Imported from West Germany
★ Sold Only by Thoresen's

1.98

Others pay $3.98 for machines that calculate to 999,999. Wizard Calculator goes to ONE BILLION—yet costs $1.98! Get more, pay less. Mechanism of Korium steel. Sleek, slim. Fits pocket. Unbreakable in normal use. Never makes a mistake. Press numbers; see totals pop into view like cash register. 101 uses. Tally scores, statements; check homework; use at market to tally purchases as you take them off shelves. Know your bill before you reach check-out counter. 3½ million pocket machines in use here and abroad. Get yours now. No. 118 $1.98.

DELUXE Executive Model in vinyl carrying case finished in morocco-grain with built-in Memo Pad. Only $2.98. Order by No. 118-D.

SMALLEST PORTABLE RADIO IN THE WORLD!

★ NO TUBES! ★ NO BATTERIES! ★ NOTHING TO PLUG-IN!

NEVER WEARS OUT FITS POCKET or PURSE!

4.99

So tiny—tucks away in pocket or purse. Carry with you everywhere—only 5 ounces! No batteries. No tubes. No plug-in. Completely personal earphone reception. Genuine crystal germanium diode rectifier NEVER WEARS OUT—works even when power failure makes other radios go dead! Enjoy thrilling programs, music, sports, news without lc cost for batteries, tubes, etc. Not a kit. Comes complete—ready to operate. Precision-made, with earphone to give you private listening without disturbing others—even in bed! Smart waterproof carrying case included. Wonderful gift for over-active boys and girls because it WON'T BREAK like expensive tube radios. Get yours now on FREE home trial!

No. 1820 . . . . . $4.99

NOW—Your Own Brand of Cigarettes for Only 9¢ PER PACK!

SMOKE 200 CIGARETTES FREE

Enjoy premium-quality cigarettes as good or BETTER than brand you now smoke yet pay—NOT 30c a pack, NOT 20c, but only 9c! Smoke king size or regular, plain or filter tip. How is this value possible? The Korium Cigaret-Maker is the answer. Turns out THOUSANDS of cigarettes. Do not confuse with wartime roll-your-own gadgets. This Korium Model is precision-made and follows, in essence, same firmly-packed principles as $100,000 cigaret machines used by big companies in Va., N. Car., etc. Operating machine easy as A-B-C. Pour in tobacco, slip in paper, press down—and presto—you have cigarette in your hands in less than 2 seconds! Send now for this "little cigarette factory" and we'll include enough FREE Corsaire tobacco for 200 cigarettes —complete carton! Also free! Handsome styrene cigarette case. After 10 days, if not satisfied, your money back in full. But smoke 200 cigarettes FREE with our compliments. Keep the case too FREE. You can't go wrong. (Additional tobacco may be purchased from us.) Order by No. 85 . . . . . $4.98

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UNBREAKABLE MAINSPRING

7.98

Water, Dust, Shock Resist

Just arrived from Switzerland! New multi-protected watch for men of action. 7 super features not found in ordinary watches. 1. Unbreakable Mainspring. 2. Shock protected. 3. Water Resistant. 4. Raised Luminous Metal Dial. 5. Sweep Second Hand. 6. Stainless Steel Screw Back. 7. Thoresen's Unlimited Guarantee. Watch guaranteed for lifetime of this firm! FREE adjustments, oiling, service, repairs! Regularly $17.98 but price SLASHED during this Christmas sale to only $7.98 plus 80c Federal tax. No. 221 $8.78. DeLuxe Model (illus.) with metal expansion band. Only $9.98 plus $1 Fed. tax. No. 221D $10.98.

Price Reduced on Hi-Power ELECTRIC PAINT SPRAYER

Same type form. adv. on TV for $19.95

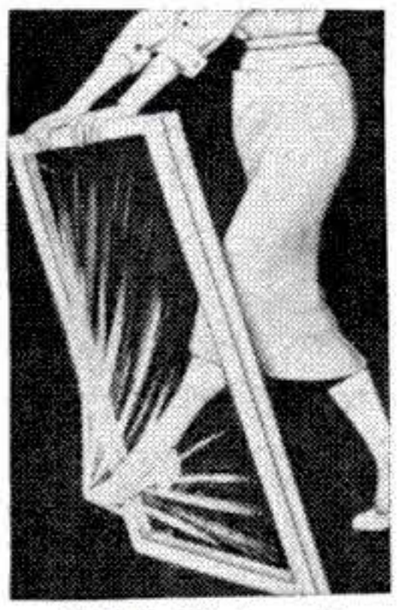
7.99

Famous Hi-Power Automatic Electric Paint Sprayer Kit at our lowest price ever. New model. New powerful, motor-pump. New adjustable MAGIC SWIVEL NOZZLE, sprays UP, DOWN, SIDEWAYS without tilting jar! STAINLESS Steel & Brass parts. Rustproof! 25-oz. jar. Cuts painting time up to 75%. Do average room in less than hour. Press button & spray. No stiff arms or sore muscles from carrying sloppy, dripping brushes. Paint screens, walls, ceilings, floors, cabinets; refinish furniture, etc. Gets into cracks, rough surfaces that brush can't even reach! Completely safe—easier to clean than brush! Approved by professionals.

Takes deodorants, lacquers, disinfectants, polishes, etc. Mothproof clothes, spray plants, paint car, etc. Same type formerly adv. on TV for $19.95 — now SLASHED to new low $7.99. Hi-Power Model sold only by mail, only by us. No. 95.

SPECIAL—DeLuxe Model with JEWELED Tip for fine, precision work. Built-in COPPER FILTER, heavy duty electric cord. Same features as in $24.95 models. Now only $9.99. No. 95-D.

Insulate Your Home with these Plastic STORM WINDOWS



FREE! 90 ft. roll of Adheso border tape

Formerly 49c each **19½c**

Why pay up to $14.00 each for glass storm windows when you can insulate with famous Trans-Kleer for pennies. Enjoy big fuel savings too. Transparent like glass yet Trans-Kleer won't shatter, rattle, break or peel. Not affected by rain, snow, cold. Install in minutes. No nails, no screws, no tools. Just cut & fit window, press on with Adheso border tape—that's all! Trans-Kleer put on from INSIDE. For airing, just lift & press down again. Shipped in rolls measuring 35"x432", enough for 10 windows. 2 million sold at $4.95—now reduced to $1.98 (19½c per window). Trans-Kleer sold only by Thoresen's. No. 74 1 kit $1.98, 2 kits (20 windows) $3.93

13-Piece Set of Chrome Vanadium DRILLS

List: $5.98

1.88

From West Germany

13 precision chrome vanadium drills from 1/16th thru ¼ inch by 64ths, enclosed in handy metal indexed jacket for quick selection. Drill thru woods, plastics, aluminum, iron, even thick-gauge STEEL! You'll get years of service from these hi-speed drills. $5.98 value. No. 13 $1.88.

Huge 9x12 sheet of tough, durable plastic. Protects carpets, floors, upholstery, outdoor furniture. Use as drop cloth when painting. Cut with shears; heat-seal with electric iron. Dust, grease, stain resistant. No. 4, $1; 3 for $2.65.

Save up to 50% on nationally advertised merchandise—famous watches, appliances, cameras, tools, hunting knives, binoculars, etc. Buy direct from importer. Prompt service. Money back guarantee. 50,000,000 people buy with confidence direct from us. THORESEN, Inc., Dept. 7-M, 585 Water Street, New York 2, N. Y.

7x35 BINOCULARS

Advertised at $24.95

9.98

Fabulous Value from America's BIGGEST Importer of Binoculars!

We've sold more than ONE MILLION binoculars in recent years, but this is our most fabulous value. Precision-made Hi-Power 7x35 Binoculars—nationally advertised at $24.95—now REDUCED to only $9.98 plus tax. Highest optical craftsmanship. Meticulously ground coated lenses. Full power without distortion or color breakdown. Made of cast metal with pebble grain, jet black covering. Smoother center focusing. Rugged yet lightweight. View for hours WITHOUT ARM FATIGUE. Excellent light transmission permits viewing in moonlight. Pigskin case, shoulder straps, four slide-on protective lens covers included at NO extra charge.

Take these binoculars on hunting, fishing, outdoor trips, on sightseeing tours with family and friends. Use them as often as you like for 10 full days. If you're not 100% satisfied, your money is refunded. No. 171: $9.98 plus 10 per cent Fed. tax., $10.98 total.

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585 Water St., New York 2, N. Y.

MAIL COUPON! PROMPT DELIVERY! MONEY BACK GUARANTEE!

THORESEN, Inc., Dept. 7-M
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RUSH items below. My money back if I'm not satisfied with 10-day trial.

☐ Check or money order enclosed. Ship postage paid.

☐ Send C.O.D. plus postage and C.O.D. fee. (Enclose $1 deposit.)

NO.	QUANTITY	ARTICLE	PRICE

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Canadian: Address THORESEN, Ltd., 439 King Street West, Toronto 2B, Ont.

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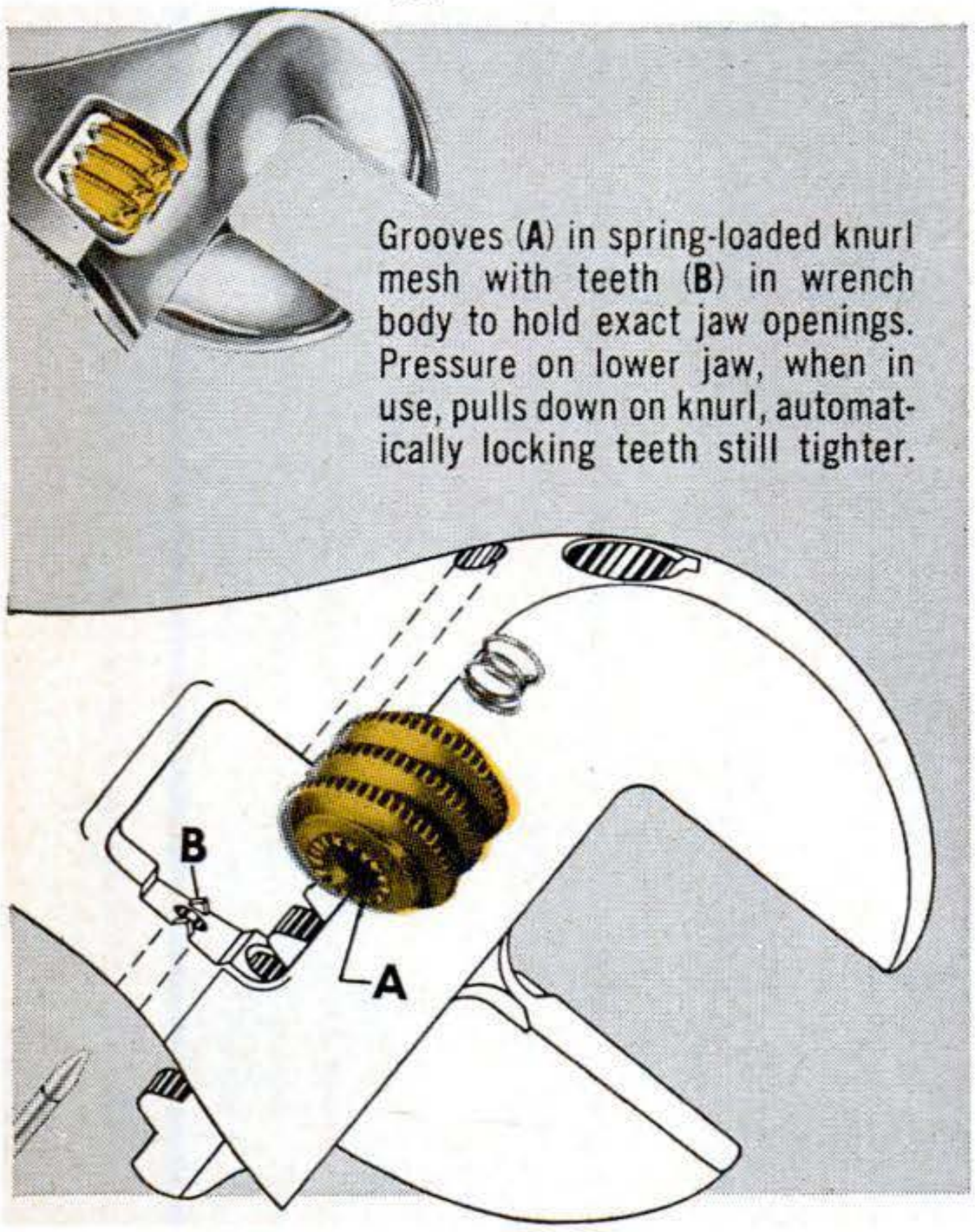
New Proto locking feature



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ADJUSTABLE WRENCHES
PAT. PEND.

No knuckle busting here! With Clik-Stop's automatic locking, you do more work in less time...and your hands are much safer. No need to reset every time you go back to same size fittings. Jaws won't "creep." No levers or gadgets to set. Proto's Clik-Stop is the only locking adjustable available in all sizes, 4" through 20". The locking feature is automatic. Buy Clik-Stops from your Proto supplier. (See the Yellow Pages.)

Available in ALL sizes

704L	706L	708L	710L	712L	716L	720L
4"	6"	8"	10"	12"	16"	20"

Meets Federal Specifications: GGG-W-631A, Type 1

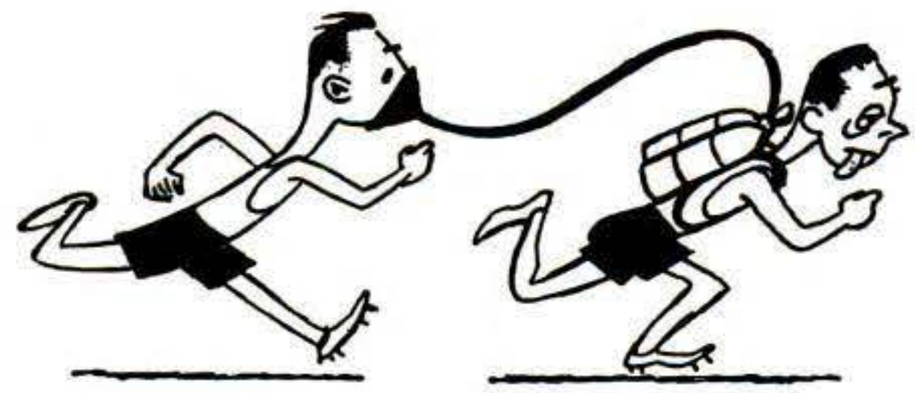
PROTO TOOLS
PROTO means PROfessional TOols
DIVISION OF PENDLETON TOOL INDUSTRIES INC.

2209 Sante Fe Avenue, Los Angeles 54, Calif.

clocked a fabulous 3:54.5 for a new world record for the mile. I wonder if the learned Dr. Peter How-fast-can-a-man-run Karpovich ["The Month in Science," Aug.] would like to revise his time estimate downward by, say, 2.1 seconds?

PATRICK J. SMITH, Toronto, Can.

. . . The good doctor of Springfield College sure miscalculated somewhere. Is



that Aussie speed demon a freak, or had he previously been fed an overdose of oxygen?

LEO J. BISSON, Somersworth, N.H.

'Tain't New Department

A CAR-RADIO volume control governed by the speedometer ["I'd like to see them make," Aug.] has been manufactured by Motorola. Optional equipment on the Ford Thunderbird, the control works on the ignition pulses and increases radio volume as engine speed increases.

M/SGT. J. A. FRAHM, APO, NYC.

Divorce to Rid Car of Hump?

JUST one more suggestion for getting flatter floors in cars [July]:

Most of today's hydraulic transmissions use a pump to drive a hydraulic motor through an oil line. Why not divorce this pump and motor? Put the motor in, or adjacent to, the differential and you'd eliminate need for any type of torque tunnel. Power would flow through a pair of hydraulic lines along the edge of the floor in the frame.

JAMES A. ROBERTS, Chicago.

This oft-proposed scheme (remember the Tucker?) always fails because of the obstinate problem of power losses involved when the pump is separated from the turbine. In a modern automatic transmission, the pump and turbine are practically married to each other—the separation is only tiny fractions of an inch. Even here you throw away something between eight and 20 percent of available engine power for the convenience of not shifting gears.

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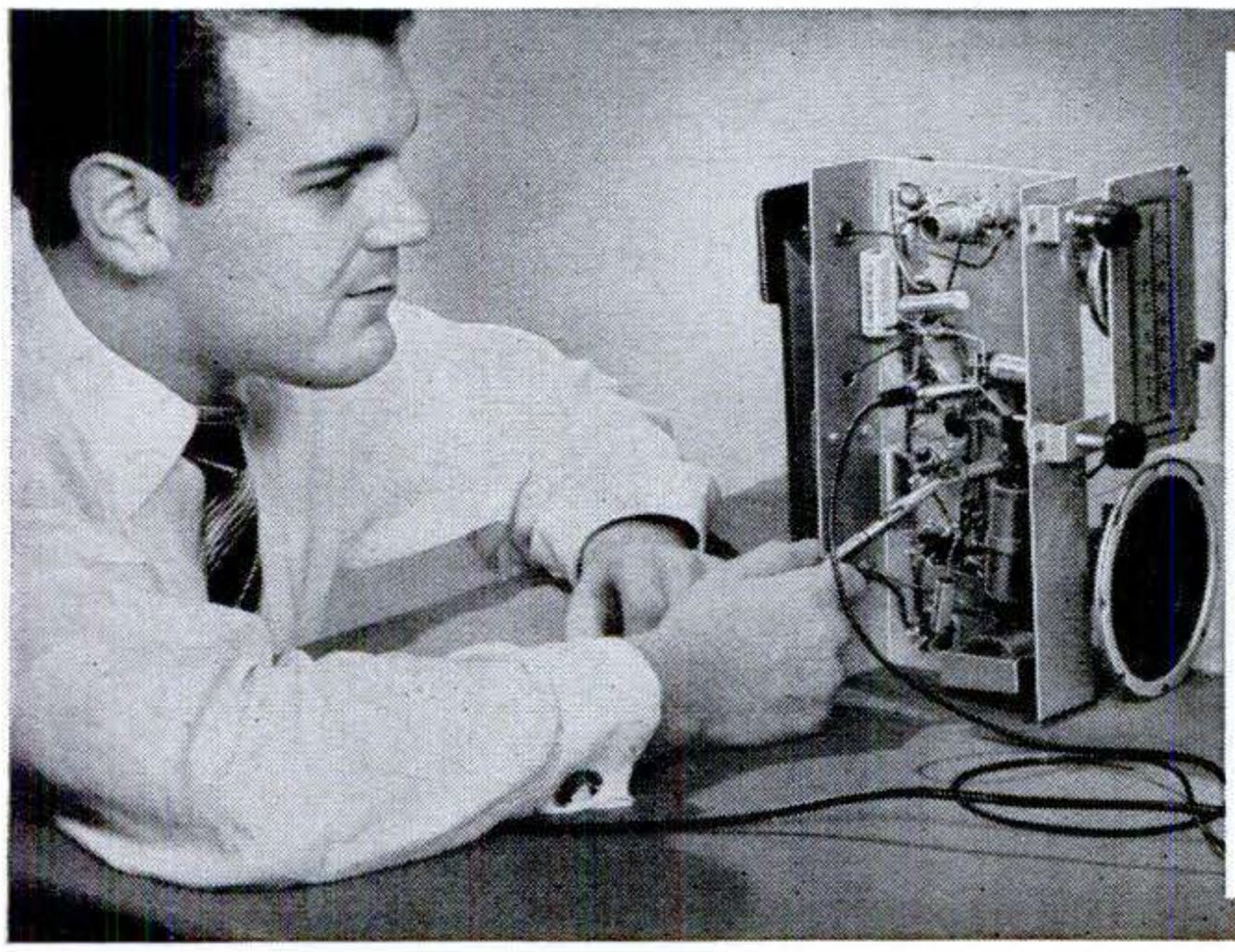
For a Successful Career in Radio-Television



Train at Home in Spare Time with N. R. I.

OLDEST and LARGEST

Home Study Radio-Television School

N.R.I. Trained These Men

ENGINEER STATION WHPE

"Thanks to NRI, I operated a successful Radio repair shop. Now I am an engineer for WHPE." VAN W. WORKMAN, HIGH POINT, NORTH CAROLINA

QUICK SPARE TIME CASH

"Knew nothing about Radio-TV when I enrolled. After 15 lessons started repairing sets. My future looks bright." DONALD B. ACKERMAN, MINNEAPOLIS, MINNESOTA

HAS OWN TV BUSINESS

"Quit my job to do Television work full time. I love it and do all right financially." WILLIAM F. KLINE, CINCINNATI, OHIO

Prosperous Fast Growing Industry Offers You GOOD PAY-BRIGHT FUTURE-SUCCESS

It's the trained man who gets ahead—gets the better job, drives a better car, lives in a better home, is respected for what he knows and can do. For a job with a future—find out how you can train at home for Radio-Television.

TODAY'S OPPORTUNITY FIELD

Training PLUS OPPORTUNITY is the ideal combination for success. And today's OPPORTUNITY field is Radio-Television. Over 125 million home Radios plus 30 million sets in cars, plus 40 million TV sets mean big money for trained Technicians. More than 4,000 Radio and TV broadcasting stations offer interesting and important positions. Color television, portable TV sets, Hi-Fi, assure future growth. Find out about NRI. Since 1914—for more than 40 years—NRI has been training ambitious men at home in spare time for Radio-TV. With NRI 50-50 method, you study basic principles AND learn by practicing with actual equipment NRI furnishes. You learn with your hands and your head. You get dependable training, backed up by the reputation of the oldest and largest home study Radio-TV school.

ADD TO YOUR INCOME SOON $10-$15 A WEEK IN SPARE TIME

Soon after enrolling many start earning extra money fixing sets. Many open their own full time Radio-TV shops after getting NRI Diploma. MAIL COUPON. Get FREE Sample Lesson and 64-page Catalog showing equipment supplied, outlines of courses, opportunities in Radio-TV. Price is low—terms easy. Address: **NATIONAL RADIO INSTITUTE, Dept. 8MB, Washington 16, D. C.**

You Learn Servicing-Broadcasting at Home—By Practicing with Kits N.R.I. Sends

Nothing takes the place of practical experience. That's why NRI training is Learning-by-Doing. With Servicing Course you build Radio shown at top and other equipment. With Communications Course you build Transmitters at left and other equipment. Catalog shows all equipment you get.

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AND OTHER OPTICAL BARGAINS

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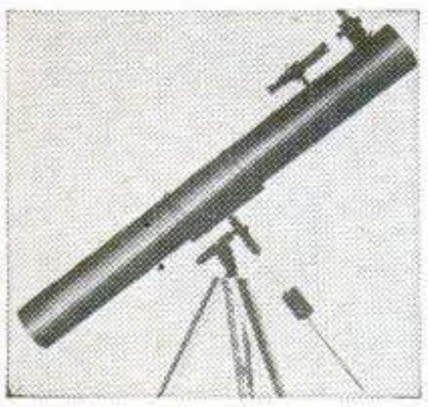
3" ASTRONOMICAL REFLECTING TELESCOPE

60 to 160 Power—Famous Mt. Palomar Type! An Unusual Buy!

Assembled—Ready to use! You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail. Galaxies! Equatorial mount with lock on both axes. Aluminized and overcoated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 60X eyepiece and a mounted Barlow Lens, giving you 60 to 160 power. Low-cost accessory eyepiece available for power up to 320. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod. Valuable STAR CHART and 272-page "Handbook of Heavens."
Stock No. 85,050-N. $29.95 Prepaid

4¼" REFLECTING TELESCOPE! Up to 270X!



With this scope you can see everything as above but with greater power plus will split finer stars. Mirror has twice the light gathering power. Mirror guaranteed to give theoretical limit of resolution. Rack and pinion focusing, hardwood tripod, real equatorial mounting—only one adjustment follows stars! Aluminum tube. 6 power finder telescope. 2 standard size eyepieces and mounted Barlow lens give you powers of 40X, 90X, 120X, and 270X. Low-cost accessory eyepiece available for power up to 540. Free handbook and Chart. Shipping weight 25 lbs.
Stock No. 85,006-N $74.50 f.o.b.

MAKE YOUR OWN ASTRONOMICAL TELESCOPE

4¼" MIRROR KIT—Contains ready-to-use 4¼" diameter concave, aluminized objective mirror, lenses for 1" focal length eyepiece, and aluminized first surface diagonal mirror.

Order Stock No. 50,074-N ..... **Price $16.25 postpaid**
Same as above—except 3" diam. mirror.
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We have additional eyepieces, tubes, tripods, in fact everything you need to build telescopes.

New! 2 in 1 Combination! Pocket-Size

50 Power MICROSCOPE and 10 Power TELESCOPE

Useful Telescope and Microscope combined in one amazing, precision instrument. Imported! No larger than a fountain pen. Telescope is 10 Power. Microscope magnifies 50 Times Sharp focus at any range. Handy for sports, looking at small objects, just plain snooping.
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War Surplus American-Made 7x50 Binoculars

Big savings! Brand new! Crystal clear viewing —7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost $195. Our war surplus price saves you real money.
Stock No. 1533-N ..... only $55.00 pstpd.
(Tax included)

SALE! TERRIFIC WAR SURPLUS BARGAIN! AERIAL CAMERA LENSES

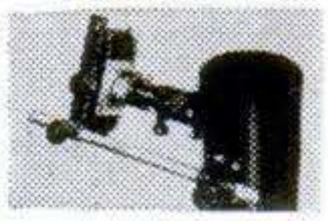
Gov't Cost $1218—Now Low as $39.50 Used

Made by B & L and E.K.—24" F.L. f/6, in 23" long Lens Cone. Use as long range, Big Bertha Telephoto lens—for Richest field (wide field, low power) telescope, etc. Lenses are 4" dia. —precision 4-element type, Aero Tessar and Aero Ektar (no choice). Easily removed. Diaphragm (f/6 to f/22) is included. Opens approx. 1" to 3½". Lens and cone—wt. 25 lbs. Sturdy carrying trunk—wt. 26 lbs.
Order Stock No. 85,059-N 24", used. Price $39.50 f.o.b. Utah
Order Stock No. 85,060-N 24", new. Price $59.50 f.o.b. Utah

SALE! WIDE ANGLE ERFLE EYEPIECE

Tremendous bargain! 1½" f.l.; Focusing metal mount is 2 11/16" in diameter. Consists of 3 coated acromats. 65° field. Govt. cost over $100. Use these with the 24" f.l. Aerial Camera Lenses to make a 16 power wide field telescope, etc.
Stock No. 50-178-N ..... only $9.95 Postpaid

TAKE PHOTOS of the MOON Through Your Telescope with EDMUND CAMERA HOLDER for TELESCOPES



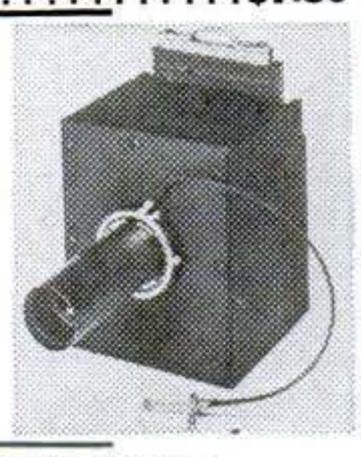
Bracket attaches permanently to reflecting or refracting telescopes. Removable rod holds camera over eyepiece to take pictures of Moon . . . or terrestrial telephoto shots of distant objects. White metal projection screen permits you to see the sun spots! Includes brackets, 28¾" rod, projection screen, screws, directions.
Order Stock No. 70,162-N ..... $9.95 Postpaid
(Send Check or M.O.—Money-Back Guarantee)

STEREO MICROSCOPE

American-Made Instrument at Over 50% Saving. Up to 3" Working Distance—Erect Image —Wide 3-Dimensional Field. Used for inspections, examinations, counting, checking, assembling, dissecting. 2 sets of objectives on rotating turret. Standard pair of wide field 10X Kellner Eyepieces give you 23 power and 40 power. Helical rack and pinion focusing. 10-DAY TRIAL . . . Complete satisfaction or your money back. **Order Stock No. 85,056-N. Full price . . . $99.50 f.o.b. Barrington, N.J.**

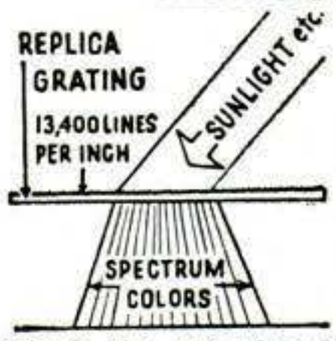
Low Power Supplementary Lens Attachment for above Stereo—provides 15X down to 6X with clear, extra large 1½" field at 6X.
Stock #30,276-N $7.50

TELESCOPE CAMERA



Takes pictures through telescope of moon, stars—terrestrial telephoto shots. 4-element lens. Box size 3 x 4 x 5". Tube that slips into eyepiece holder 1¼" O.D. for standard telescopes. Included: Yellow filter, film holder 2¼" x 3¼", cable release, ground glass 3¼" x 4½". Precision German-made shutter—T., B., 1 sec., ½, 1/5, 1/10, 1/25, 1/100 and 1/200.
Stock No. 70,166-N ..... $39.50 Postpaid

REPLICA GRATING—LOW, LOW COST



It's here—after decades of effort! Replica Grating—on film—at very low price. Breaks up white light into full spectrum colors. An exciting display. 13,400 lines per inch, running along way on film 8" wide—grating area 7½". Thickness about .005". Dispersion about 24°. Use it for making spectroscopes for experiments, as a fascinating novelty. First time available such large size—so cheaply. Comes in clear plastic protector.
Stock No. 40,267-N—piece 8" x 11" ..... **$1.50 pstpd.**
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The month in science

Big squeeze pays off. Only three years after General Electric started squeezing cheap graphite into synthetic diamonds, the process has hit pay dirt. Not for jewelry—GE's diamonds are the size of grains of sand—but for grinding wheels used to sharpen the tools that make cars and planes and washing machines.

- Production plan for this year was more than a million carats—$3,000,000 worth.
- The price has dropped by a third. It's now $2.96 a carat. That's slightly higher than natural industrial diamonds. (A one-carat gem may cost hundreds of times that.)

Reason for the quick success: Synthetic diamonds are better.

The crystals are rougher and blockier. They stick to grinding wheels longer, cut more easily. Synthetic-diamond wheels outwear natural-diamond wheels by as much as 75 percent.

The same process that makes diamonds—tremendous pressure (1,500,000 pounds per square inch, equivalent to a rifle bullet hitting armor plate) coupled with high temperature (3,600 degrees)—promises other very useful materials. Some don't exist at all naturally. A couple have already been made:

- Coesite, a denser, high-pressure version of quartz that is very resistant to corrosive hot acid.
- Borazon, a high-pressure compound of boron and nitrogen that is as hard as diamond and more durable in other respects. It, too, is a good bet for grinding wheels.

Future prospects are still more alluring. They include:

Brand-new metals. Hydrogen, normally a gas, should transform into metal at 6,000,000 pounds per square inch. Ammonium, ordinarily found only as part of a compound (in ammonia water, for instance), should become an independent metal at 3,000,000 pounds.

Pressure-strengthening of present metals. High pressure, by eliminating irregularities or promoting the growth of large single crystals, could bring metals much closer to their high theoretical strength.

Resistance-free electric wires. Most metals conduct current 20 percent better at 1,500,000 pounds pressure. Some improve by 400 percent. Still higher pressure might eliminate resistance altogether (a trick possible now only if a wire is kept cooled hundreds of degrees below zero). The savings on electric bills that would mean!

Catch those subs. The U.S. Navy's chief worry is Russia's vast submarine fleet: 500 boats, by far the greatest undersea force of any nation ever. They regularly probe Atlantic areas of U.S. surveillance.

Perfecting ways to locate and destroy subs gets more Navy money than anything else. Admiral Arleigh Burke, Chief of

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The month in science

Naval Operations, calls it "the most difficult technical problem which confronts the Navy."

Sub-finding techniques now in operation include everything short of living, breathing bloodhounds: sound, "smell," radar, magnetism.

A couple of new tricks, recently described by the Navy:

- Project Caesar. This is a fence of underwater listening posts along both coasts. Small sound receivers encased in plastic are submerged offshore, connected by cable to control stations on land. They pick up the noise of ships more than 100 miles away, even cancel out random interference to recognize very weak but meaningful signals.
- Sniffer gear. These are "smelling" devices carried by anti-sub aircraft. The exhaust from a conventional submarine's diesels generates electrically charged particles in the air. The sniffer gear detects the electric charge many miles downwind, can follow it like a dog on a scent.

Atomic submarines (the Russians don't have any yet) have no diesel engines to make exhaust gases, but they do leave a track of radioactivity in the water. The Navy is now developing radioactivity sniffers to follow that trail.

Even so, the odds still favor the subs.

Afterburners for autos? Airplane engines burn up fuel left over in the exhaust with afterburners, gaining a little extra power. Now the idea is being explored for cars in an effort to prevent smog.

Auto exhausts also contain unburned fuel, compounds of hydrogen and carbon. These get much of the blame for stinking up city atmospheres. So scientists at Atlantic Research Corp. tried consuming them in a separate flame.

Conclusion (from lab, not car, tests): It would work at idling and deceleration if the exhaust hit the burner at a temperature of 440 degrees. At cruising it's tougher. Temperature required: 1,240 degrees.

Calling direct. Now you can dial—from an outside phone—straight to the desk of the man you want in a few big companies. You skip right by the company switchboard operator.

The idea is simple. The company gets an automatic exchange all its own—like a small town. You dial the exchange—say LI 4—followed by the number of your man's extension.

DID (Direct Inward Dialing) saves time and money. Your charges start when the extension answers, not when the company operator answers. Long-distance, you would pay a station-to-station rate instead of person-to-person, which costs more. So far only three large offices—Du Pont in Wilmington, Boeing in Seattle and AT&T in New York—have the DID system.

Martin Mann

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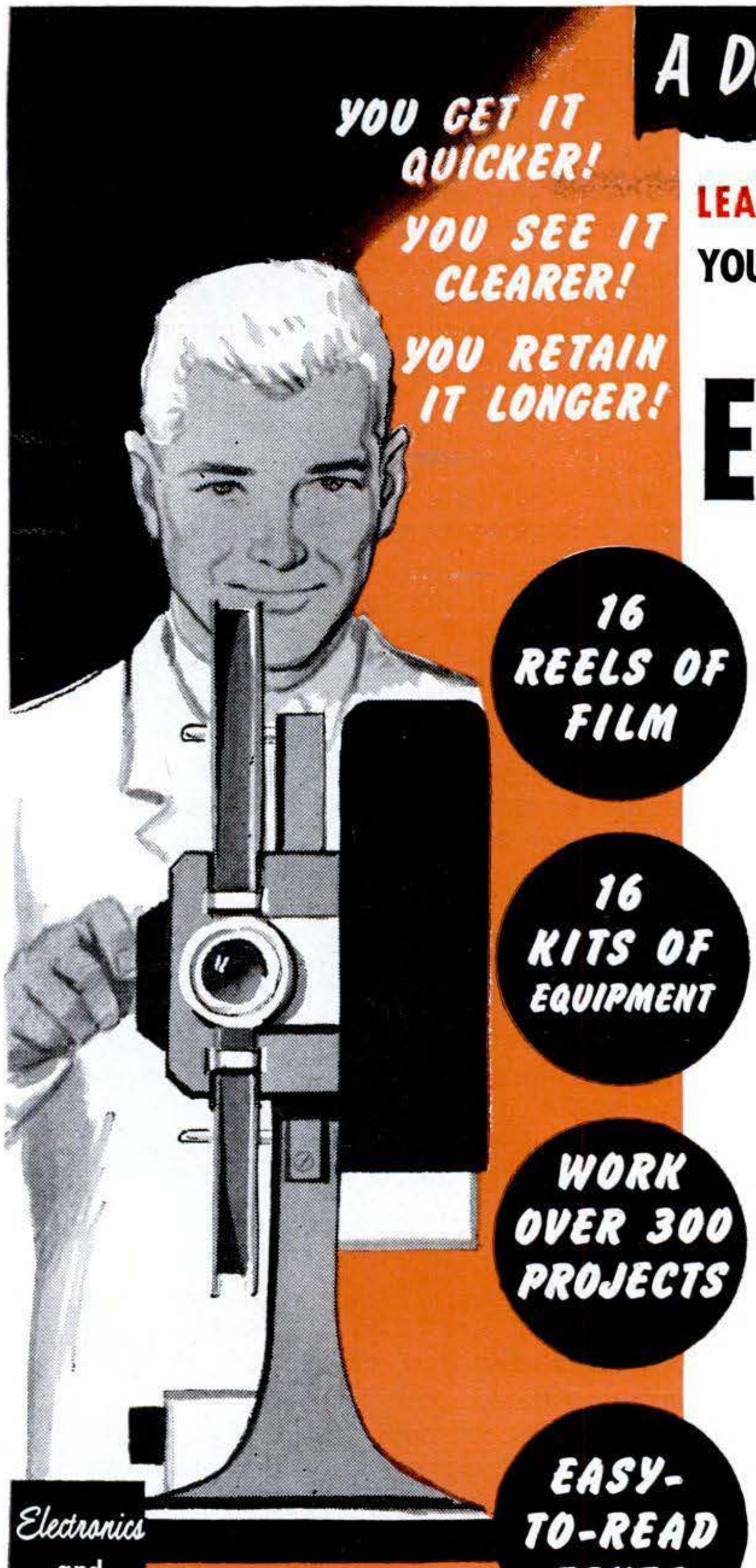

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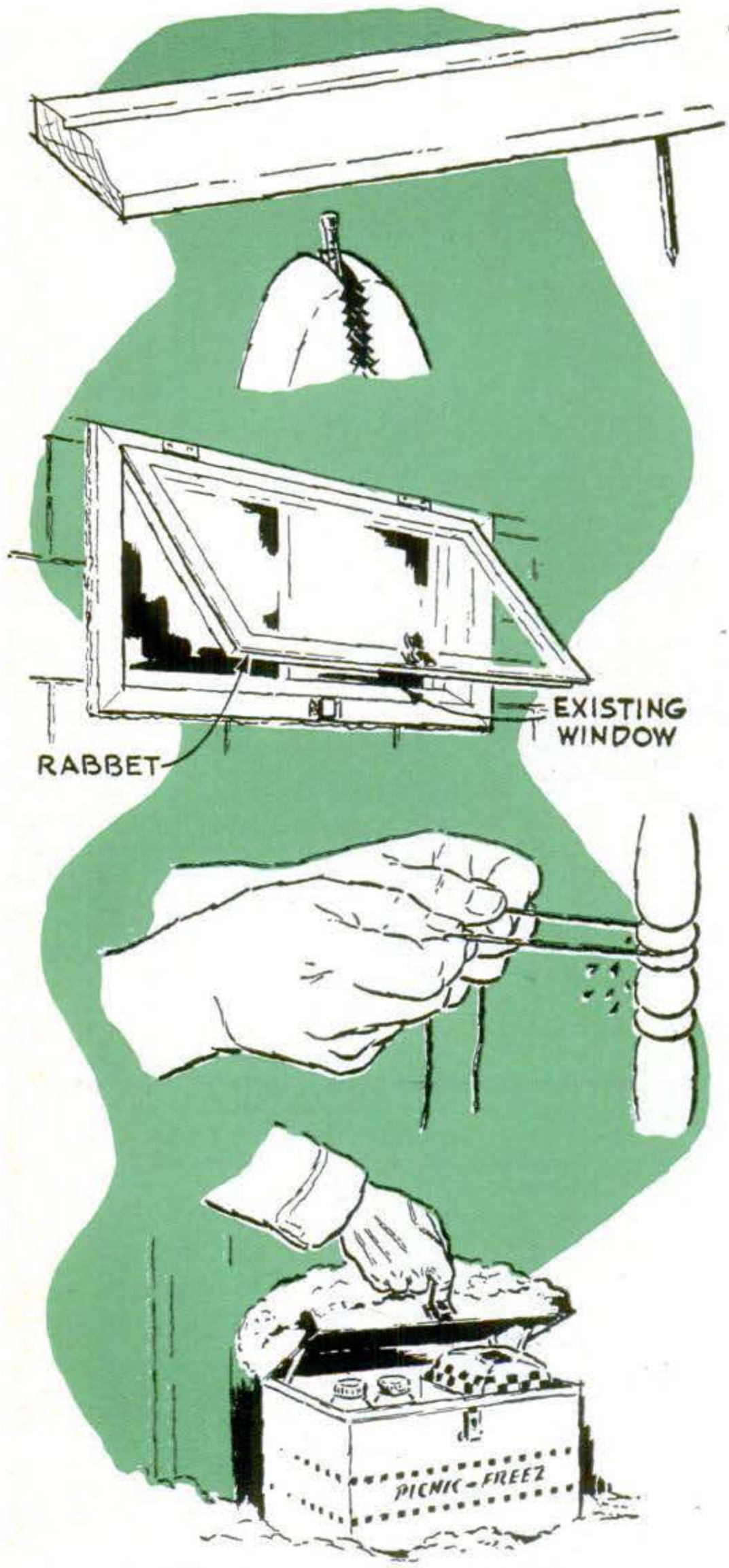
5 BUDGET SAVERS for Home Owners



1 Salvage the wood when remodeling. After removing door and window trim, wainscoting, baseboards or plate rails, pull the finishing nails *through* the wood instead of backing them out. That way, the finished face won't be marred.

2 You'll save money on fuel bills if you put storm sash on basement windows. Make a frame of one-by-three stock and fasten it to the wall with wood screws and lead anchors set in the masonry. Apply calking compound to the back before installing it on the anchors. Make the storm sash of one-by-two stock and rabbet it front and back to fit into the wall housing and to take the glass. Top-hinged, the sash is held shut by a cabinet catch.

3 It takes less paint remover to get down to bare wood in deeply grooved turnings if you remember this tip: Clean out the softened gunk in grooves by yanking a length of rough cord around them.

4 An insulated ice chest bought for summer picnics can earn its keep over the winter. Placed near the back door, it will hold milk or bread deliveries and keep them from freezing in frigid weather.

5 Instead of revarnishing, if furniture shows a disfiguring bloom, try wiping it gently with a soft cloth lightly moistened with kerosene. This often works when simple washing has no effect. To finish, rub to a polish with a woolen cloth.

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Experts say that over 400,000 air conditioners are to be installed in autos this year. The field is growing very fast. Already auto shops are advertising for skilled air conditioning mechanics. Opportunities are excellent for starting repair shops. Some day, air conditioners will be standard equipment on cars. So get in on the ground floor now. Our catalog has information on this specialized, profitable field. It's worth looking into.

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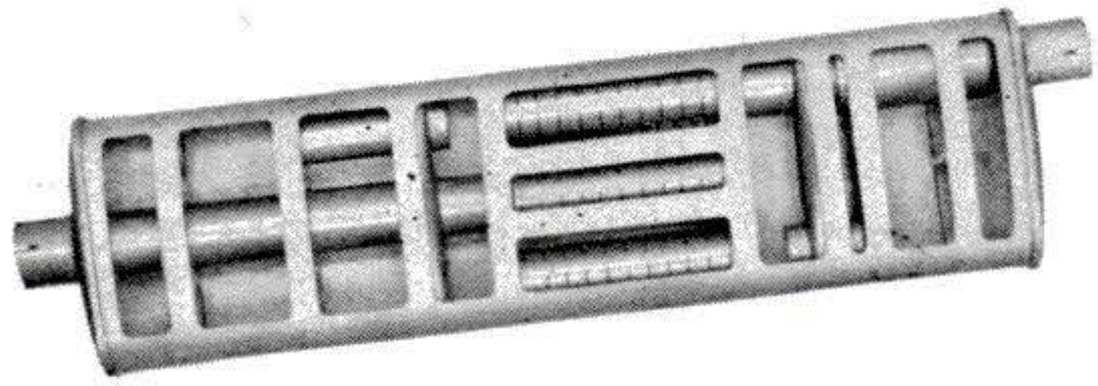

There are five major causes of muffler trouble—and here are the steps Chrysler Corporation engineers have taken to combat them in the MoPar Sono 4-X:

Internal muffler corrosion: A car's engine manufactures about a gallon of water for every gallon of gasoline burned. This water contains enough sulphuric and other acids to quickly corrode the material of an ordinary muffler. The new MoPar Sono 4-X muffler combats this corrosion by means of galvanizing—*from the head and shell to the outer wrap.*

Internal muffler temperature variations: These are rough on a muffler because water containing diluted acid accumulates in "cold spots," allowing it to corrode muffler metal. The new MoPar Sono 4-X is specifically designed to *maintain a uniform temperature throughout,* allowing this water to vaporize and be blown out the exhaust.

Engine backfire: Fuel vapor explosions can rip the body seams and tear off the heads of ordinary mufflers. The MoPar Sono 4-X guards against this danger by means of heads that are spun or rolled into the shell—giving strong, gas-tight interlocking of the shell and head material.

Road shock: The constant flexing of a muffler head and neck during rough driving leads to metal fatigue in ordinary mufflers. In the MoPar Sono 4-X galvanized heads, shell and outer wrap, plus double-locked seam joints, assure *highest resistance* to metal wear.

External damage: Contact with high road centers, rocks, ice, snow, salt, water, curbs and ramps is the reason many mufflers wear rapidly from the outside. The *extra sturdiness* and balanced construction of the MoPar Sono 4-X offer the greatest resistance to external damage yet devised in the industry.

To get the *most advanced muffler* made today, see your Plymouth, Dodge, DeSoto, Chrysler or Imperial dealer, or leading independent repair shop featuring MoPar products. He has the *MoPar Sono 4-X* in stock now—at competitive muffler prices!

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You ought to know...

Plan to build a house? . . . add a carport? . . . finish the attic? You'll be ahead of the game if you start now rather than wait. Lumber and plywood prices at major Northwest mills, up sharply since early summer, show no signs of slumping this winter. Barring economic upset, expect even higher prices next spring.

Fir lumber—the kind used in house frames—showed an average price hike of 25 percent. Finished pine, more stable, jumped less and later. But plywood rose 35 percent over last spring's figures.

One thing that pushed prices up so far so fast: Retailers had let their stocks run low. As buying picked up, the mills weren't able to turn out the goods fast enough. Many of the smaller in-and-out mills that usually mushroom in the spring never did come to life because prices were so unattractive.

Weather was another factor. The hottest, driest summer on record in the Pacific Northwest and British Columbia forced closing of many forest areas as a precaution against fire.

Gasoline vs. fuel oil. The oil industry is shedding bitter tears over a situation it can't seem to do much about: When the price of gas goes down, the price of heating oil goes up. If they try to reverse one trend, they only speed the other. Why? Mainly because refiners turn out two gallons of gas every time they turn out one of heating oil. If they try to build up low fuel-oil stocks, they end up overproducing gas.

Aggravating the situation has been a smaller demand for gas over the summer. Recession affected vacation plans for many, and just plain wet weather discouraged others.

To make matters worse, refiners have been able to squeeze more gas out of every barrel of crude oil than ever before: 53 percent this year as compared to 49 last year.

Can the industry shift its yield pattern to get a better than 1:2 ratio of heating oil to gas? Now that the price of heating oil has moved up, there'll be more of an incentive to change.

What impresses you? . . . a swimming pool . . . a snazzy power boat . . . a trip abroad . . . or a brand-new car? Auto strategists, sure for a long time that the new car was *the* status symbol to most Americans, are beginning to have some deep doubts. Detroit forecasters see car sales leveling off to an average six million a year. Among the clues to this melancholy outlook:

- Americans have been spending less of their after-tax income on cars since '55—out of proportion, even, to the decline in income.
- Functionalism may be winning over style: More and more people buy cars for specific purposes—the little errand-running imports, station wagons, even "family" sports cars.
- Detroit's higher and higher styling each year has caused some switching to relatively timeless foreign models.

That last item could spell disaster to one of the basic principles

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You ought to know...

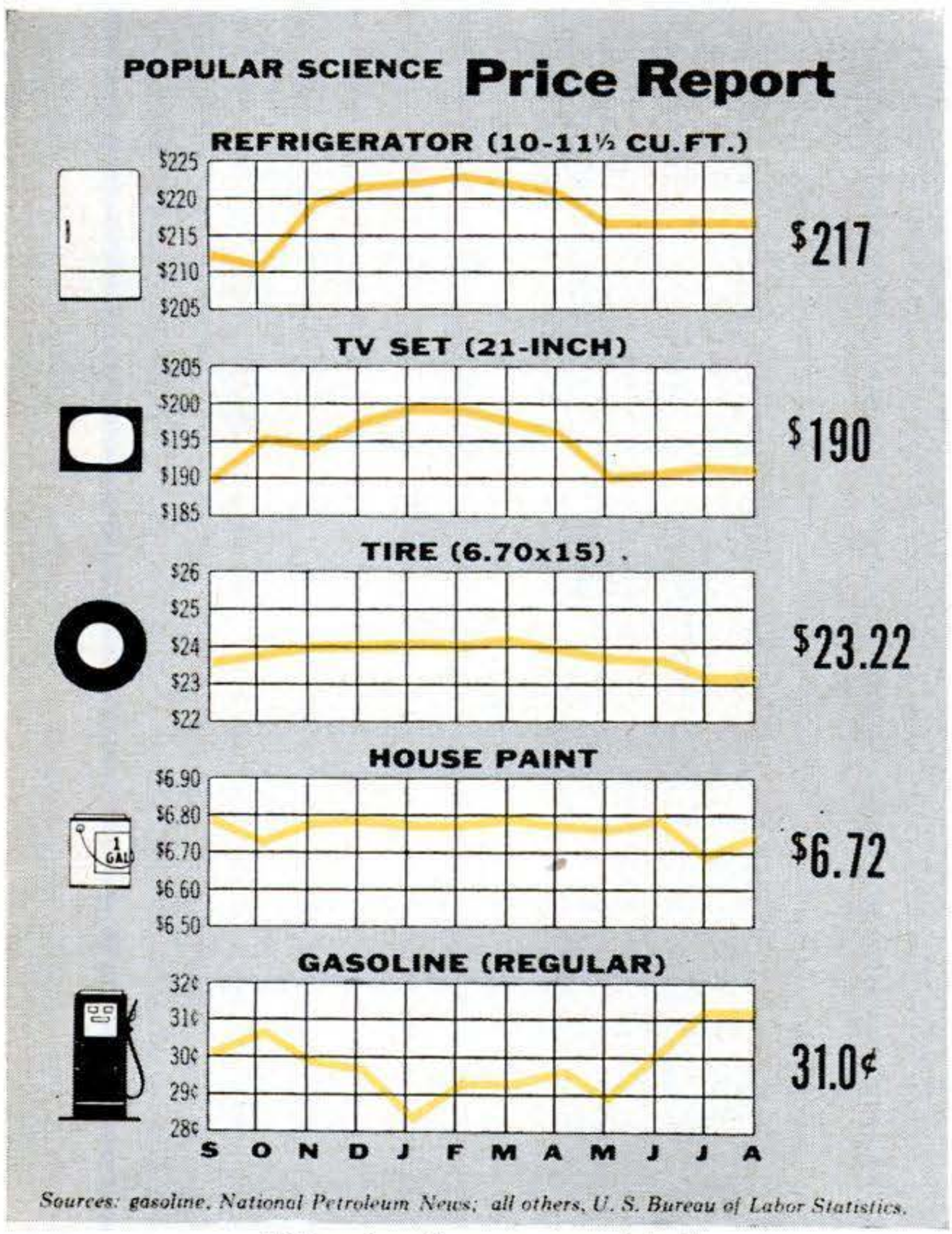
in industry thinking: To boost sales, a newer, dreamier model is needed every year to make the customer feel his old car is outdated. There are mutterings that the engineering expense is getting out of hand. Pretty soon, some think, only Ford, Chevy and Plymouth will continue yearly model changes.

More volts in car batteries. At least one Detroit expert predicts that 12-volt car batteries, standard for the last couple of years, may give way to 24-volt jobs in the near future. Reason: Hydraulically operated components such as power steering or brakes may change to electrical operation, requiring higher voltage. Why the change? This engineering source sees two prime factors: 1) safety—fewer power failures would occur if units were electrically operated; 2) space-weight trimming—the switchover would reduce poundage of components as well as cut space required to house them.

The man in the white coat must go. Happily for the TV viewer, the National Association of Broadcasters has amended its code to prohibit one particularly obnoxious form of commercial—the so-called "white coat" drama.

These are the little gems that use the typically white-clad, Vandyked, bespectacled actors to suggest great medical authority behind their pill-pushing pitch. Before, they allowed this kind of thing when the words "A Dramatization" were flashed on the screen for 10 seconds; now they'll permit it only if presented by "fully accredited members of such professions."

Government action forced the code revision, which also forbids advertisers from representing that stomach acid or concentrated stomach acid is capable of burning a hole in a cloth napkin.



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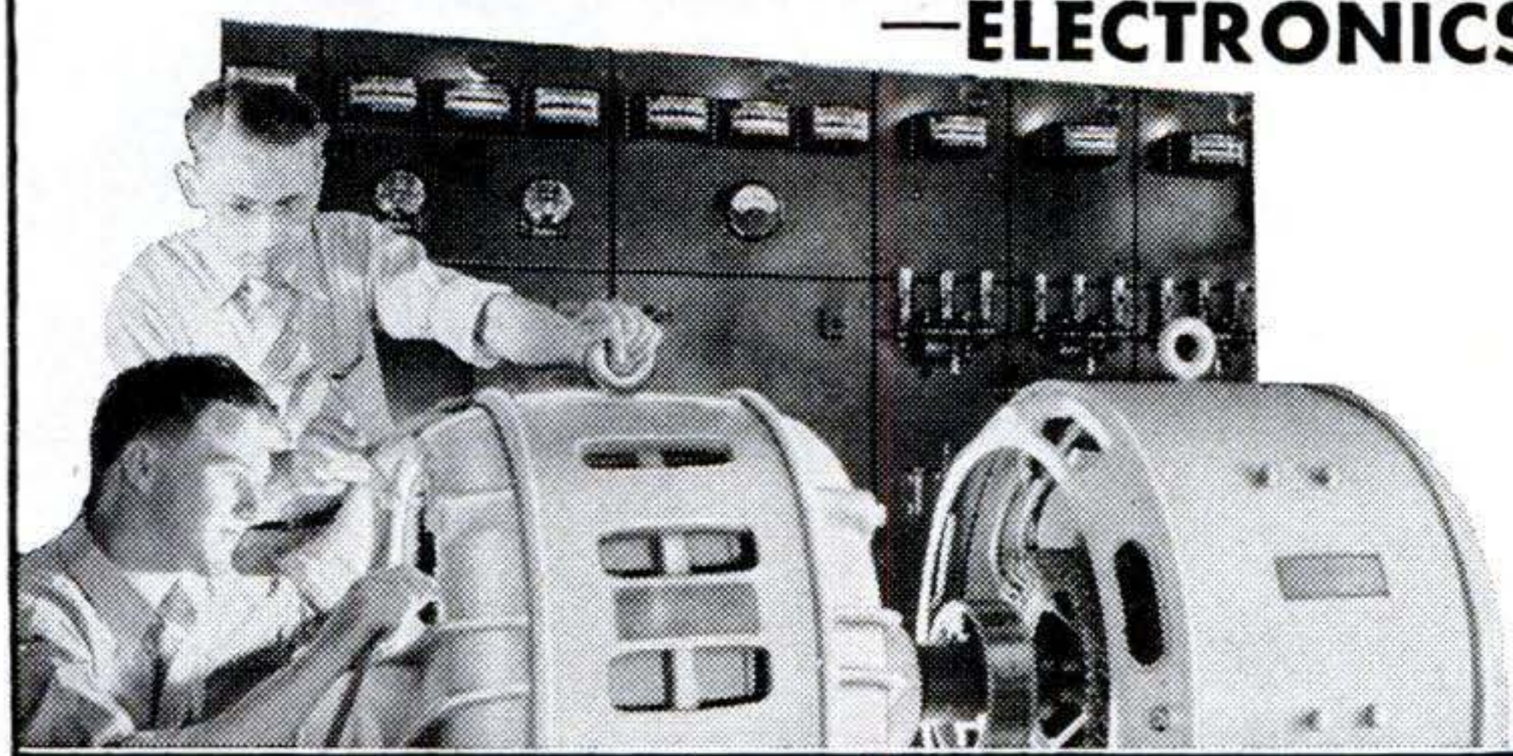

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JUMBO ALUMINUM-FOIL BAGS for turkeys. Wrapping a 20-pound bird in foil for roasting is a big job and the sheet is difficult to seal.—*Mrs. J. Mihalick, East Liverpool, Ohio.*

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EASY-TO-IDENTIFY PLYWOOD. Dye one ply of exterior plywood, and it couldn't be confused with interior stock when you work with leftovers.—*J. Mitchell, Akron, Ohio.*

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America Is Short 100,000 Auto Mechanics!

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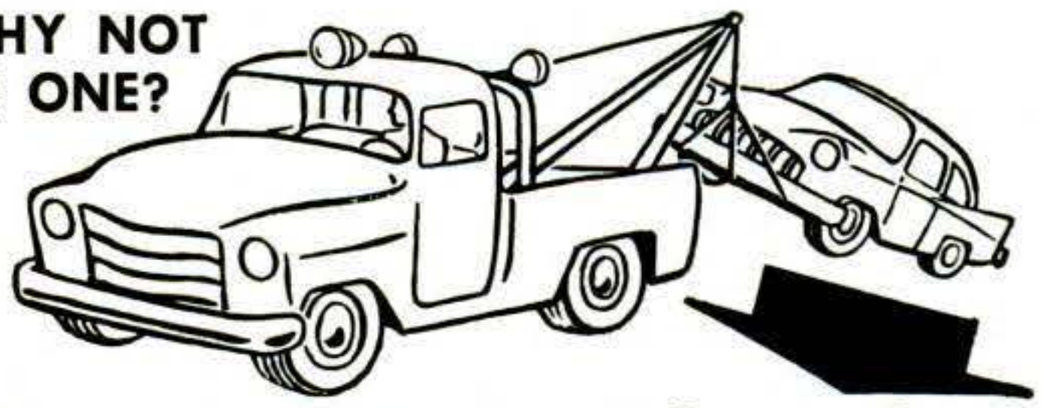

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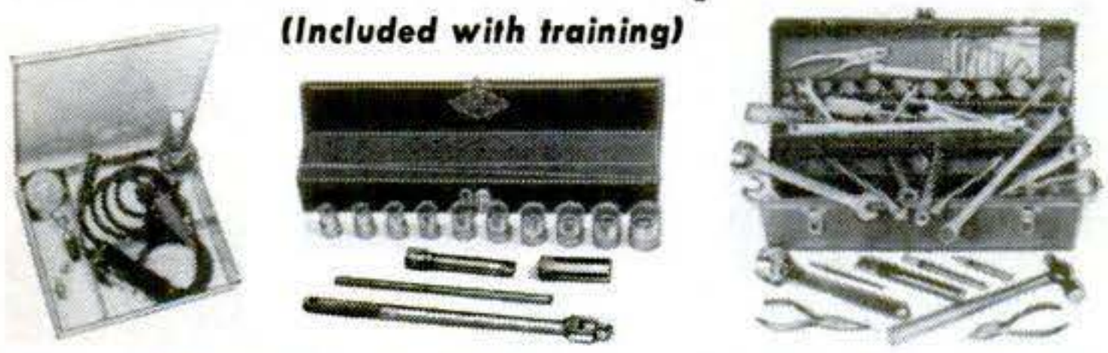

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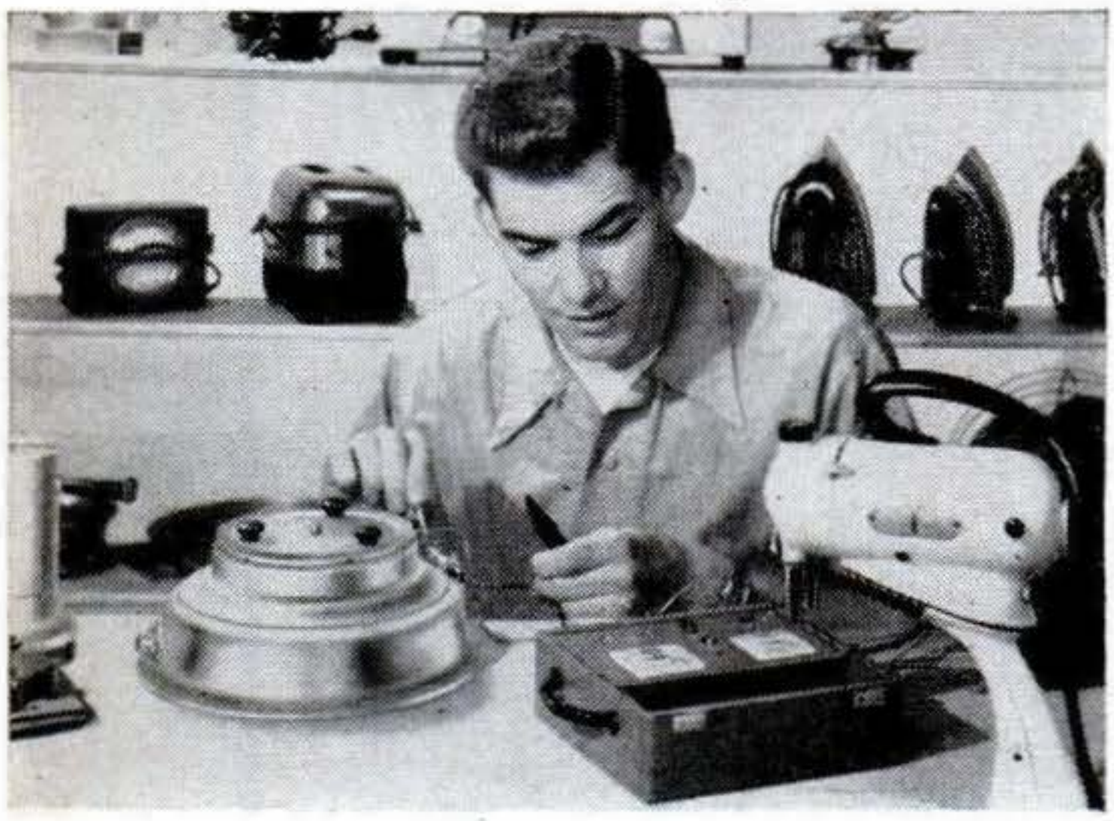

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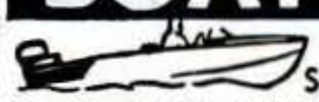

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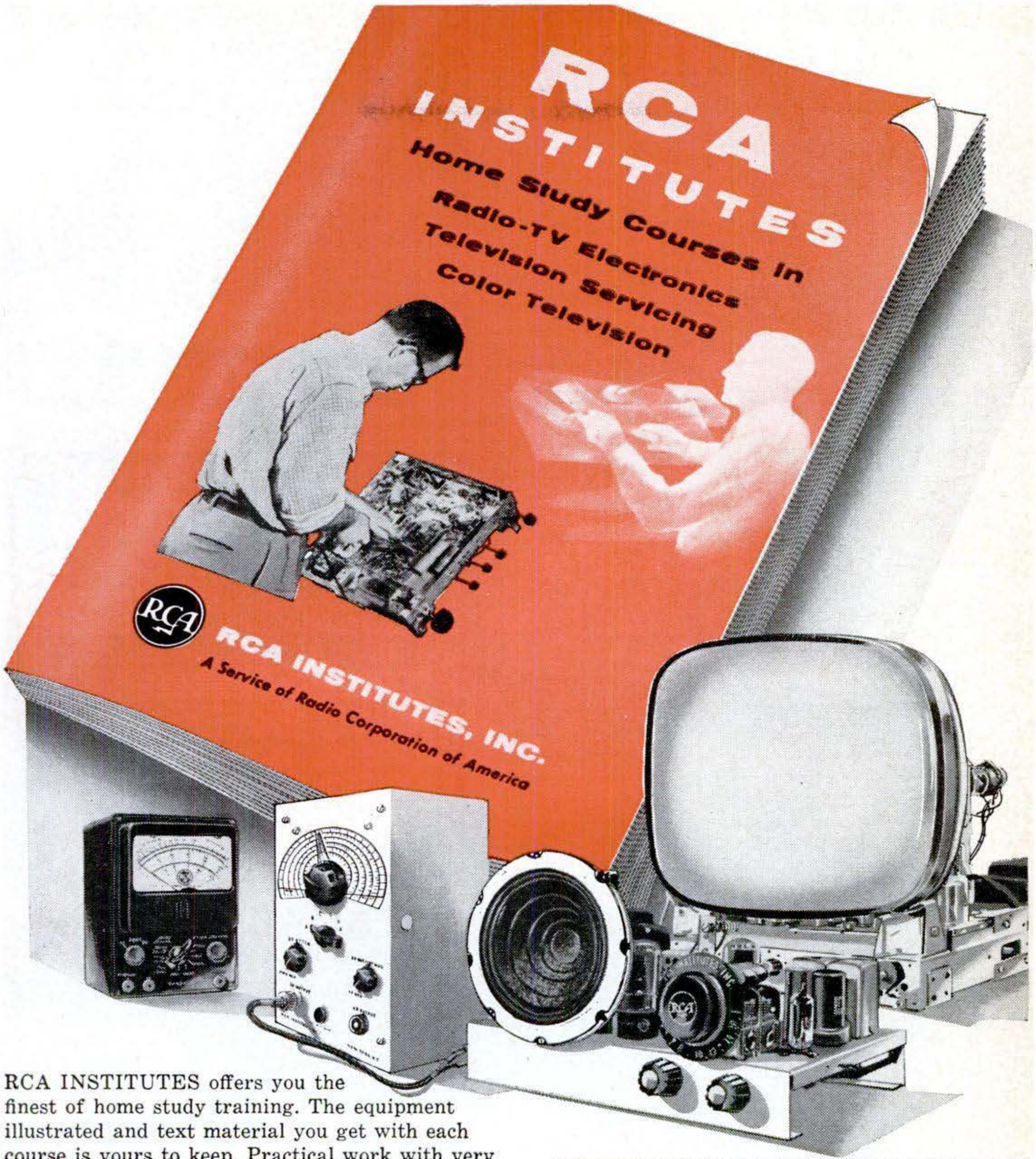

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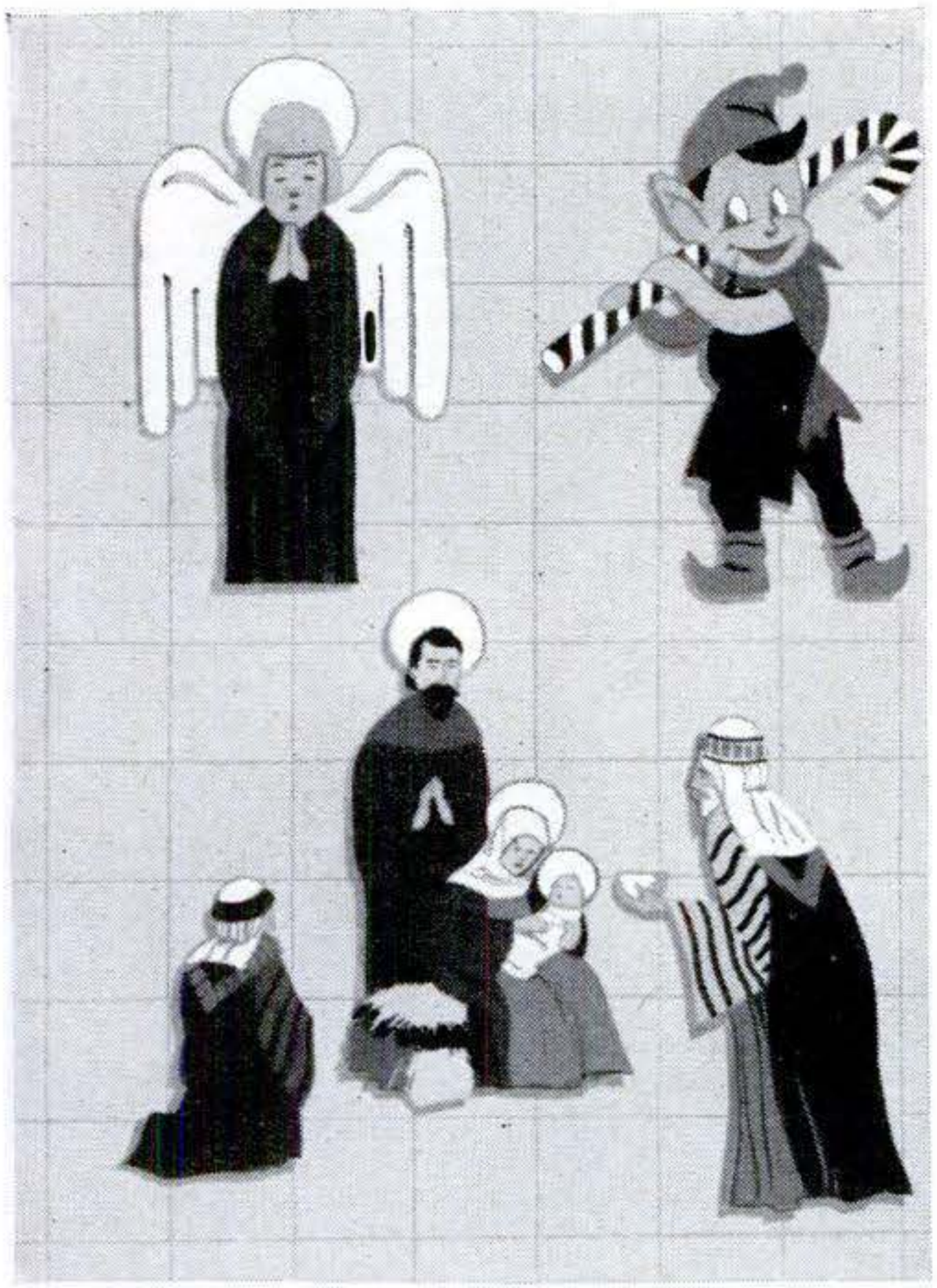

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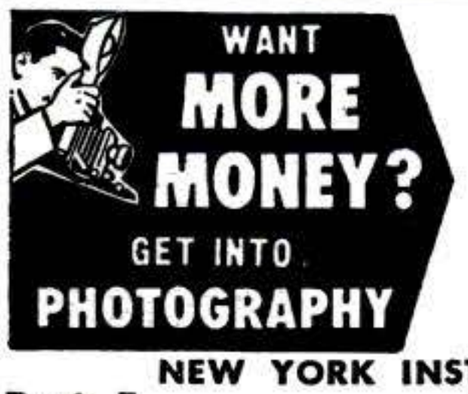

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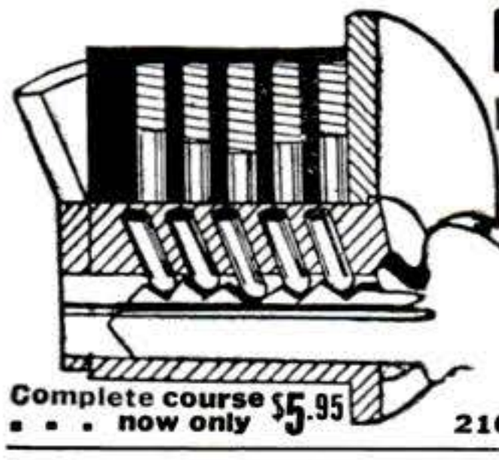

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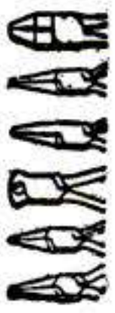

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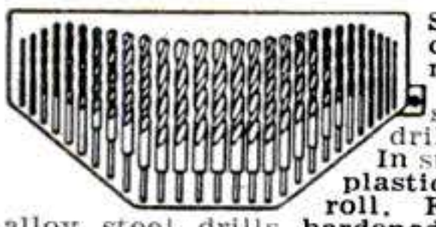

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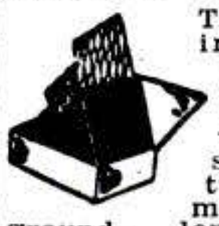

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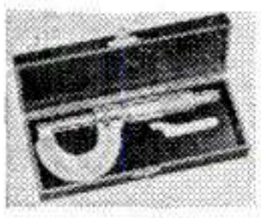

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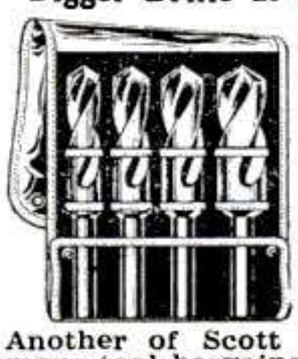

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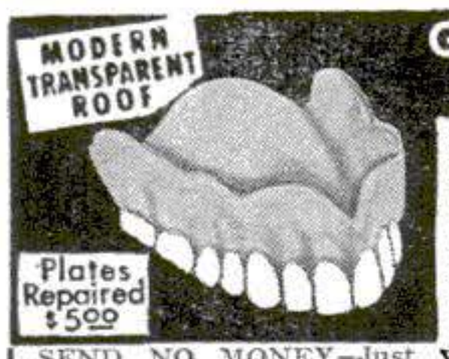

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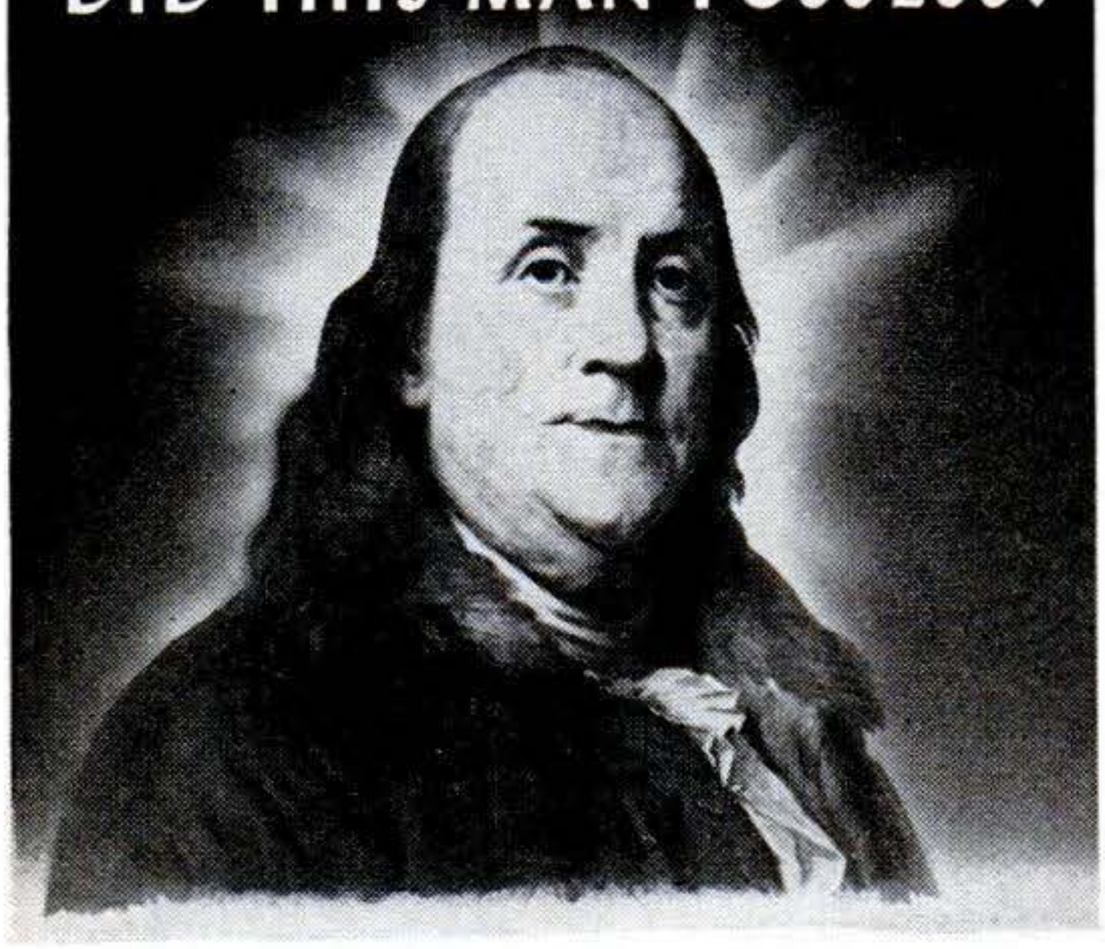

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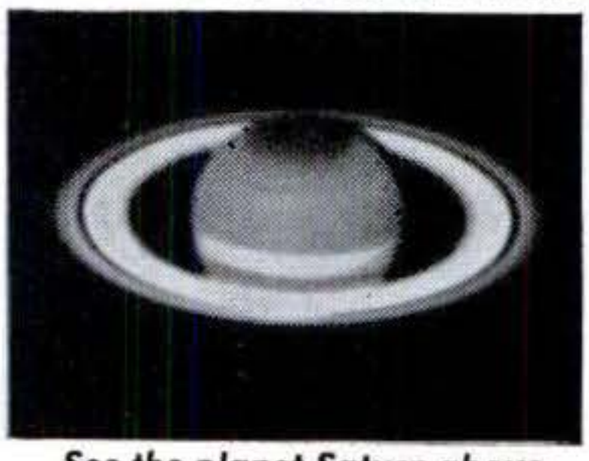

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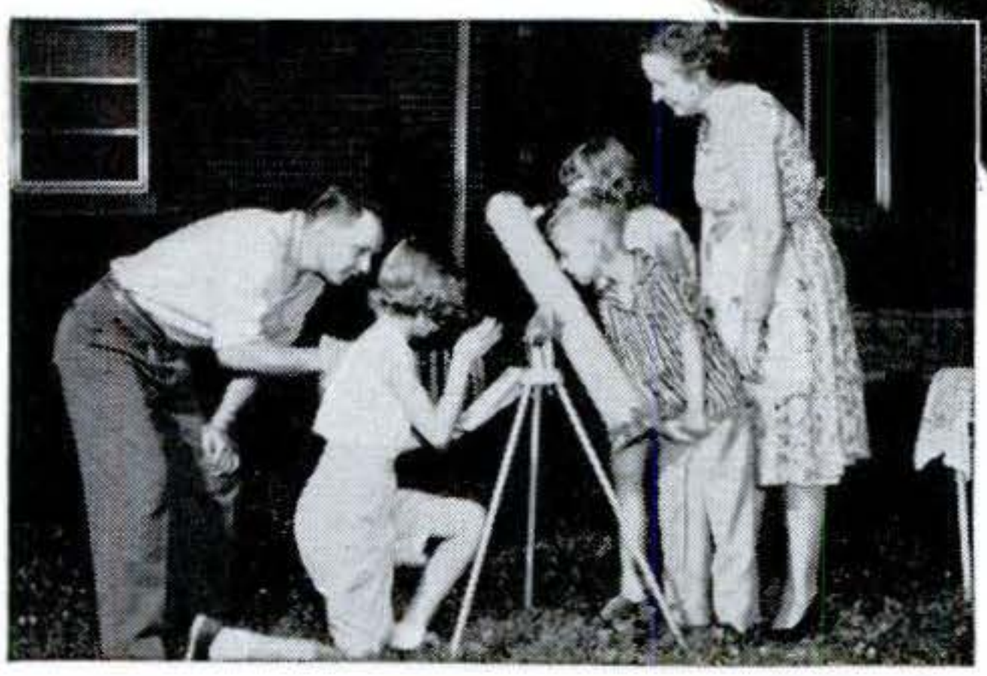

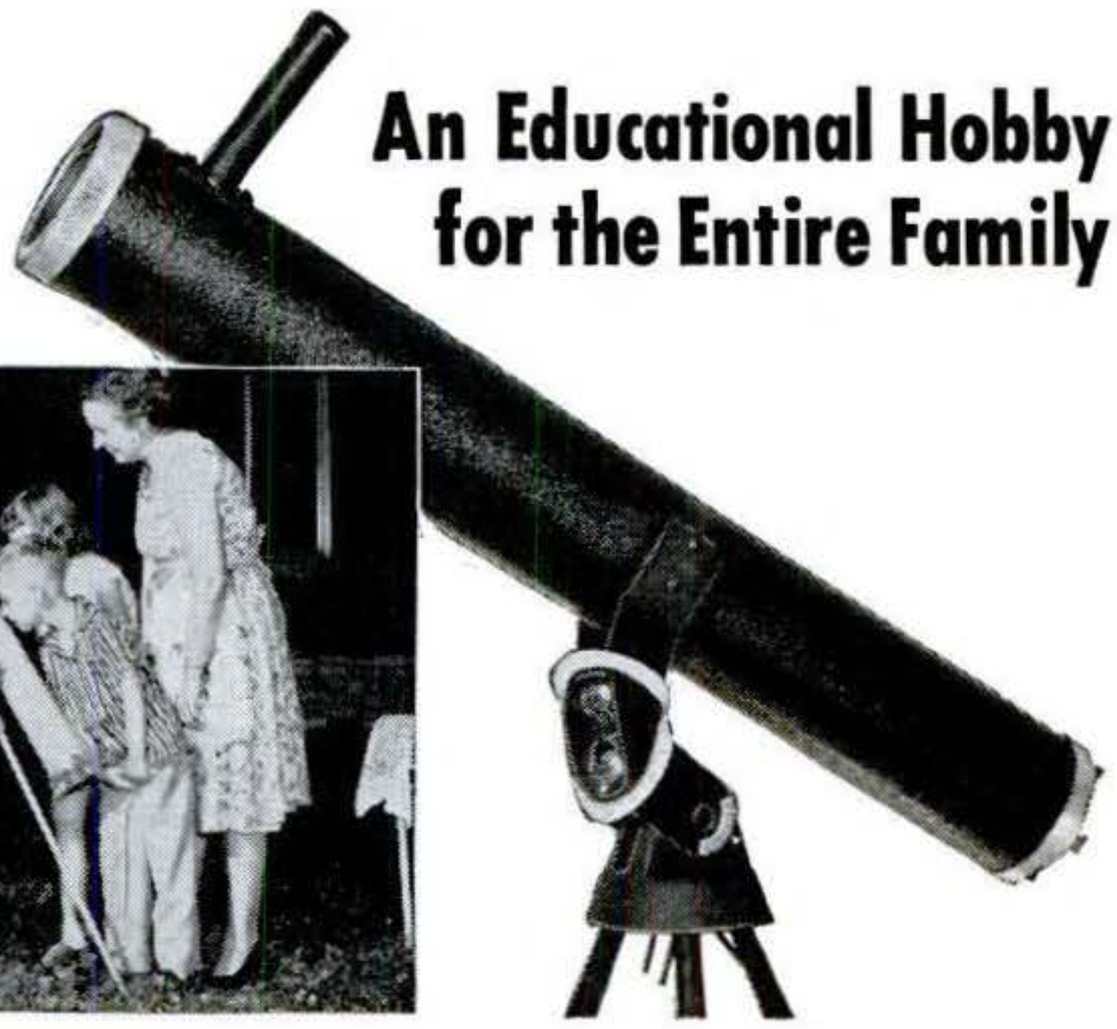

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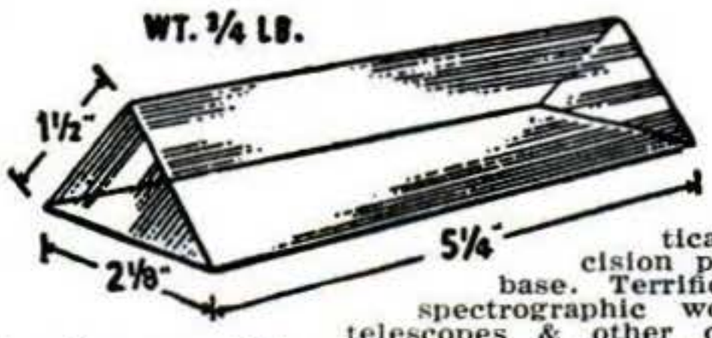

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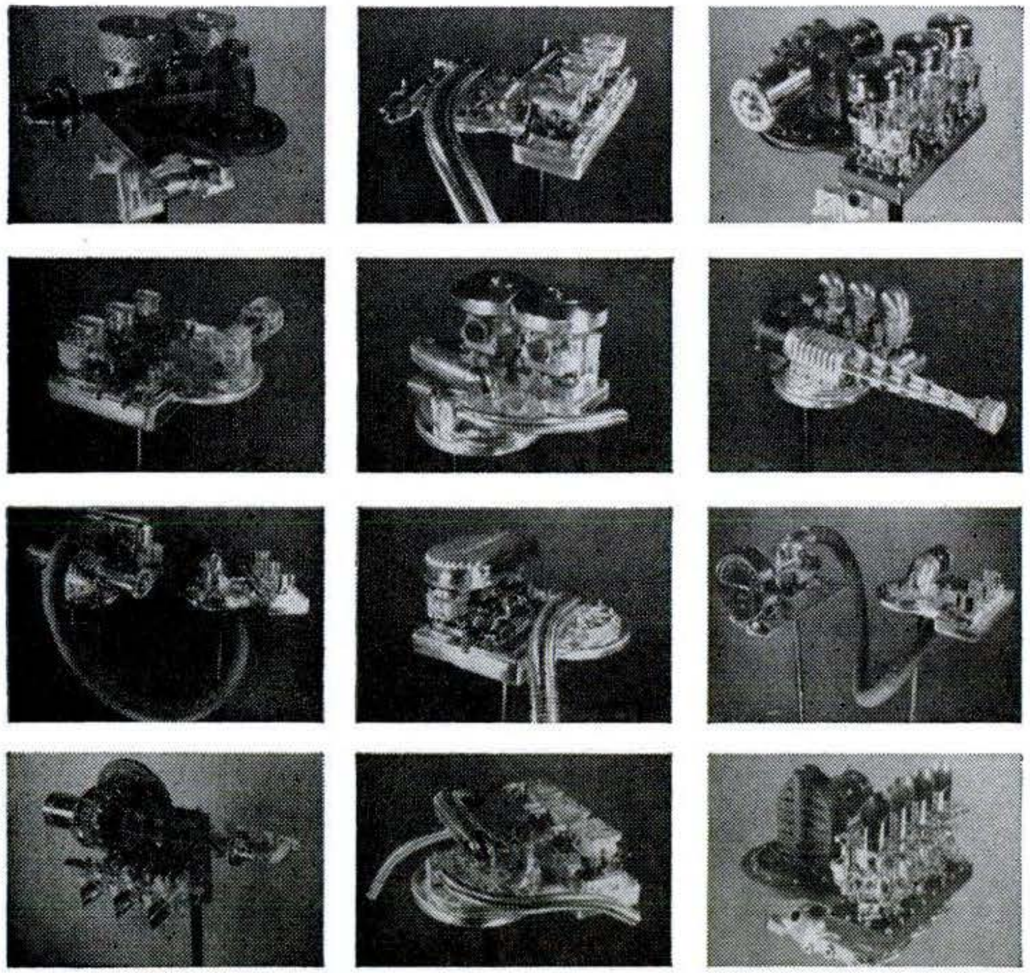

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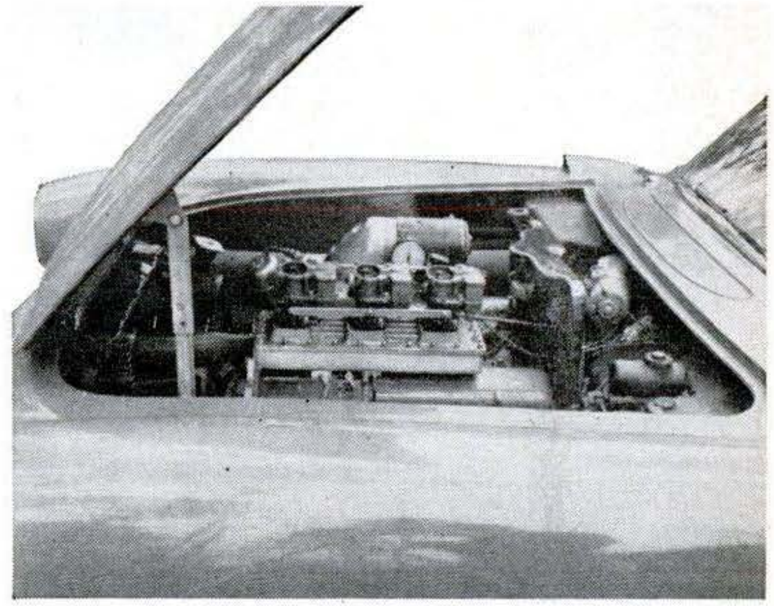

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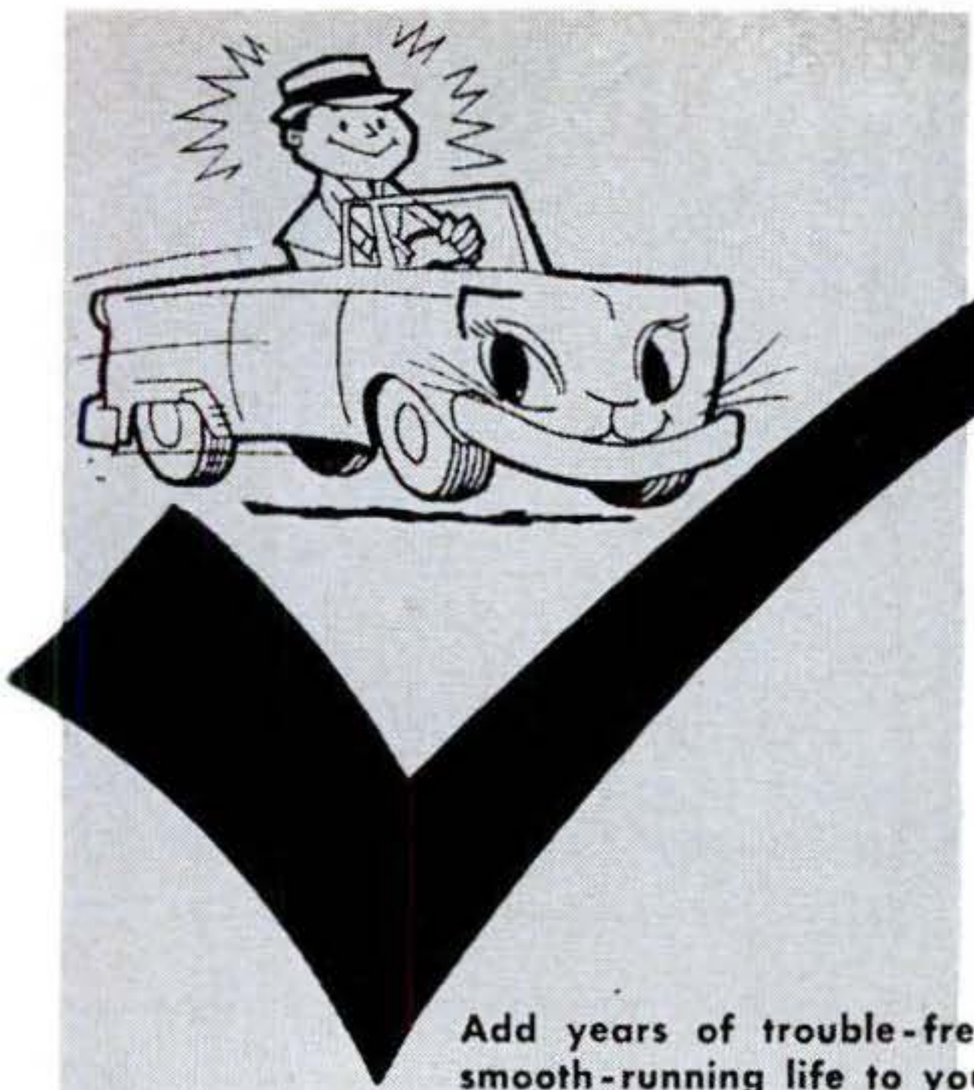

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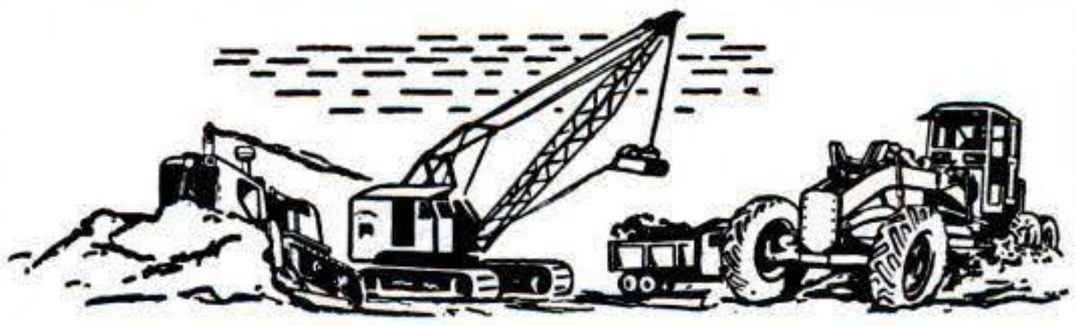

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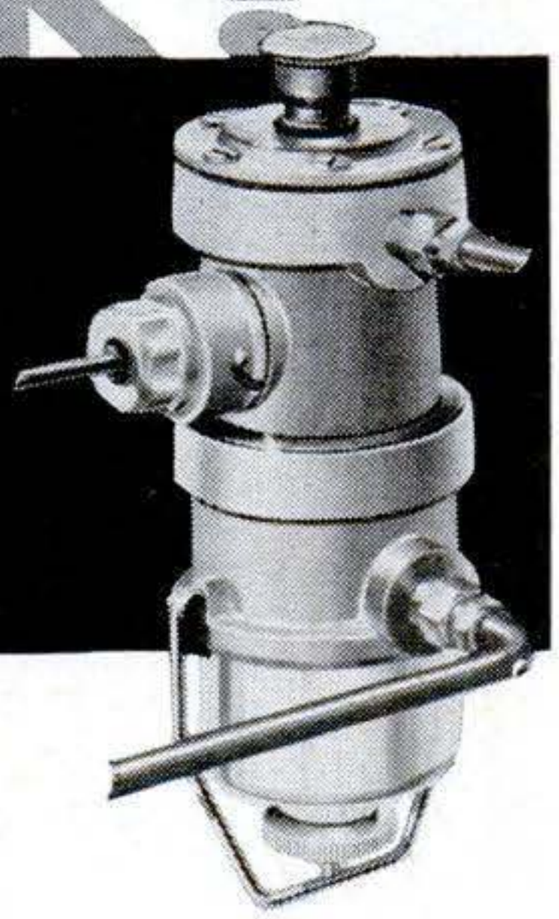

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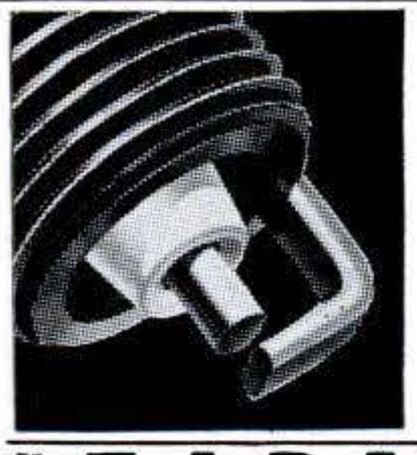

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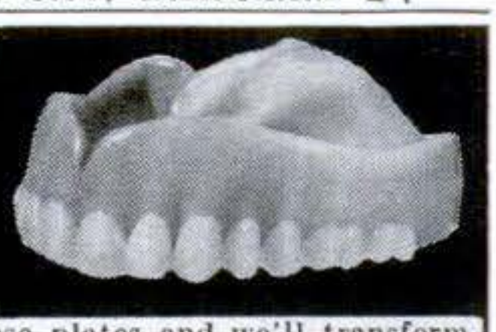

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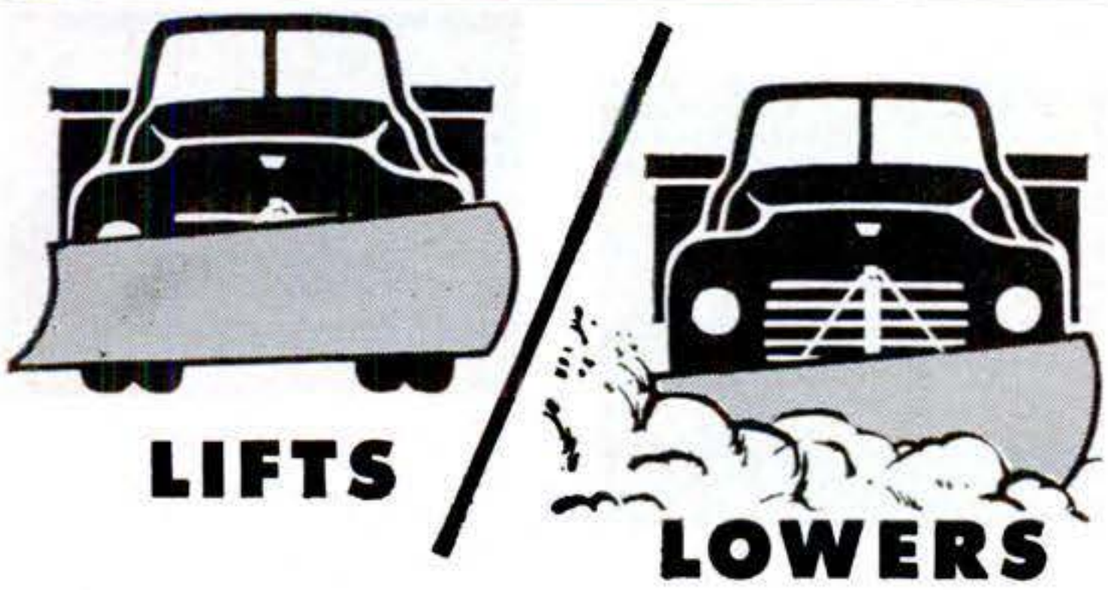

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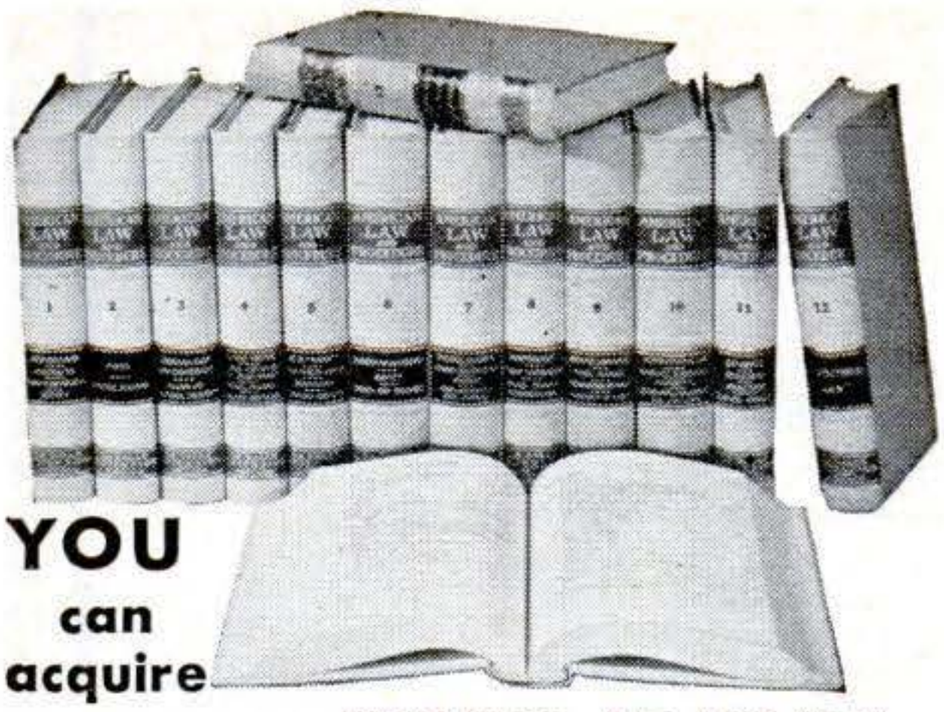

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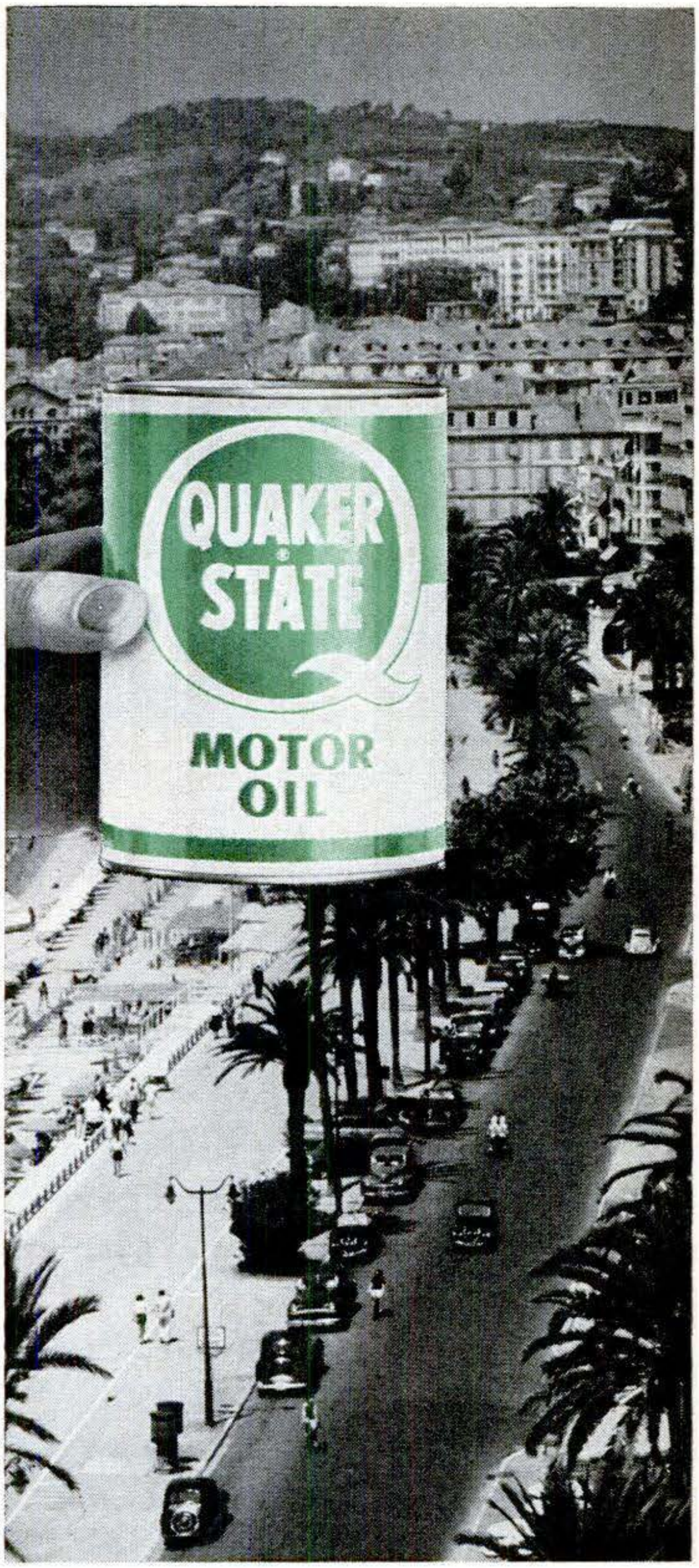

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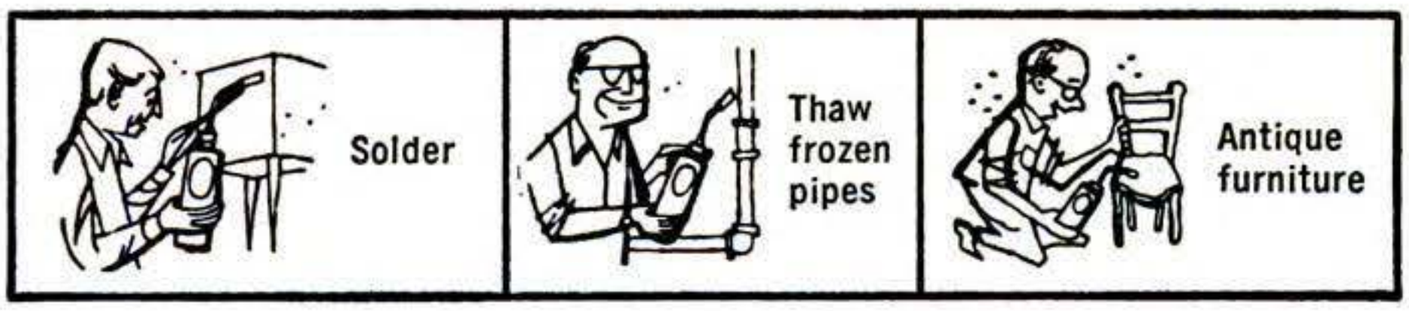

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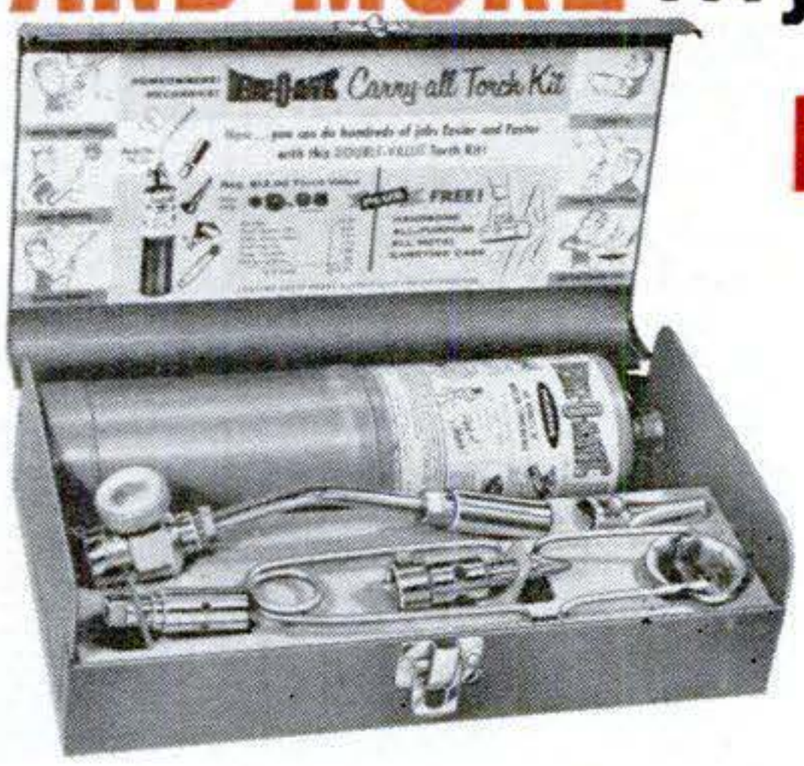

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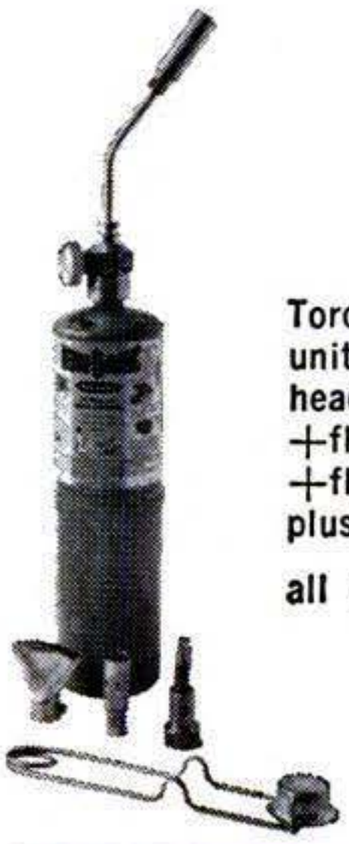

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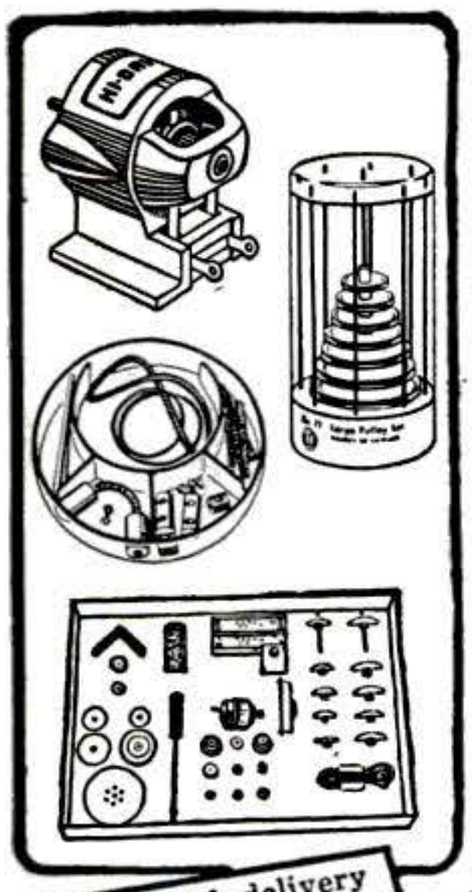

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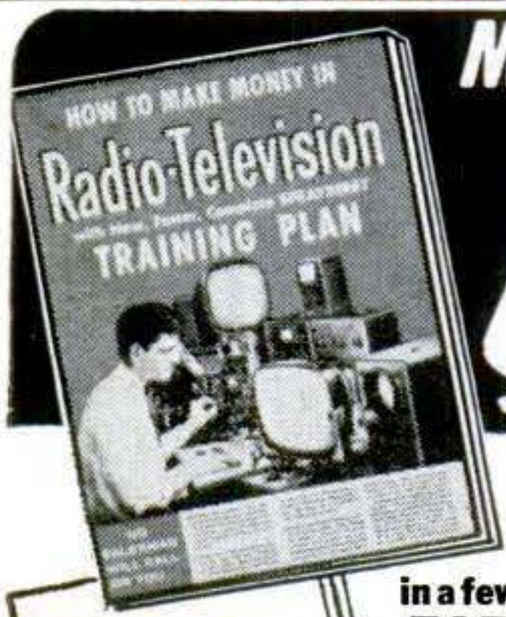

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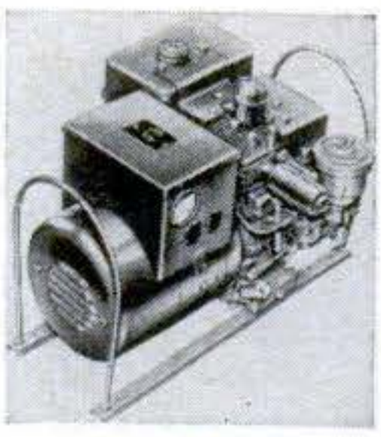

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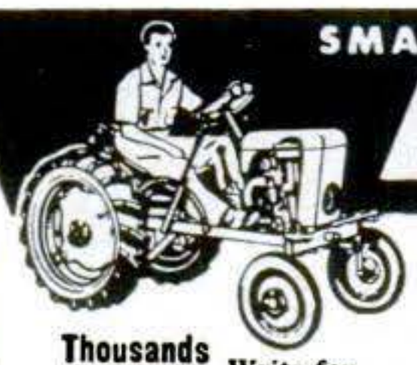

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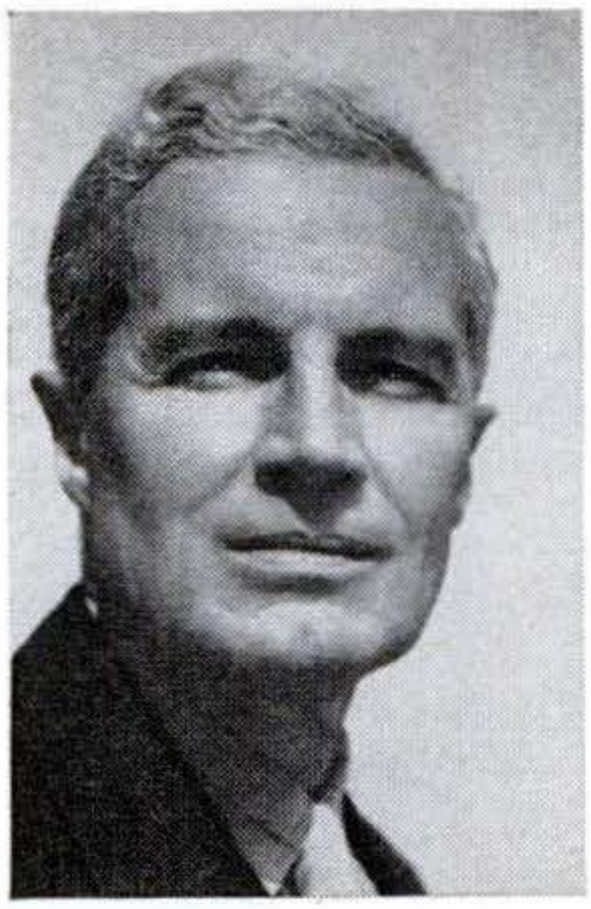

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by Victor B. Mason

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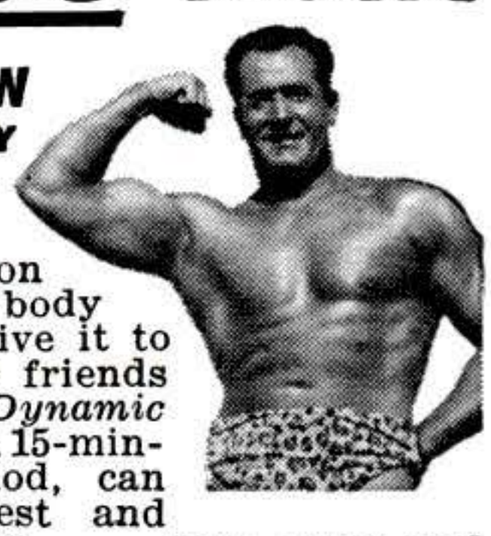

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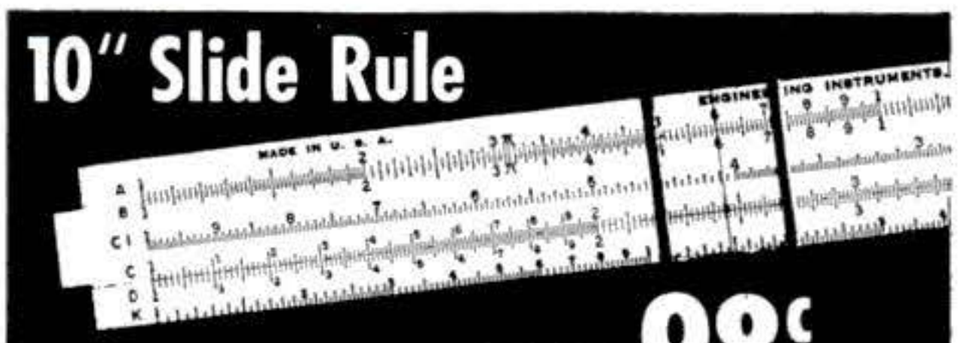

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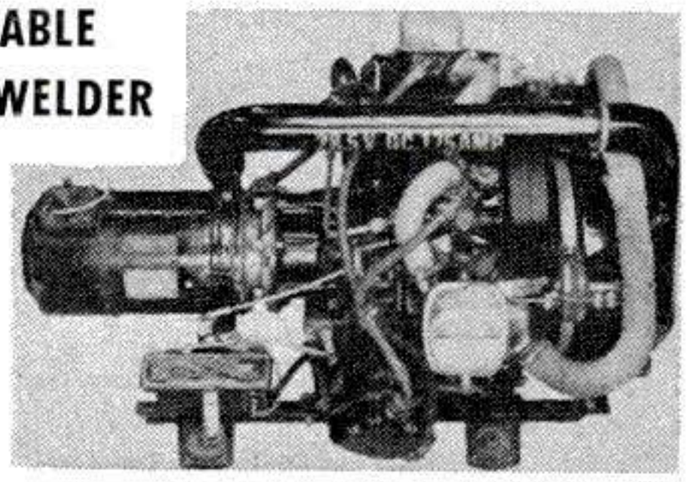

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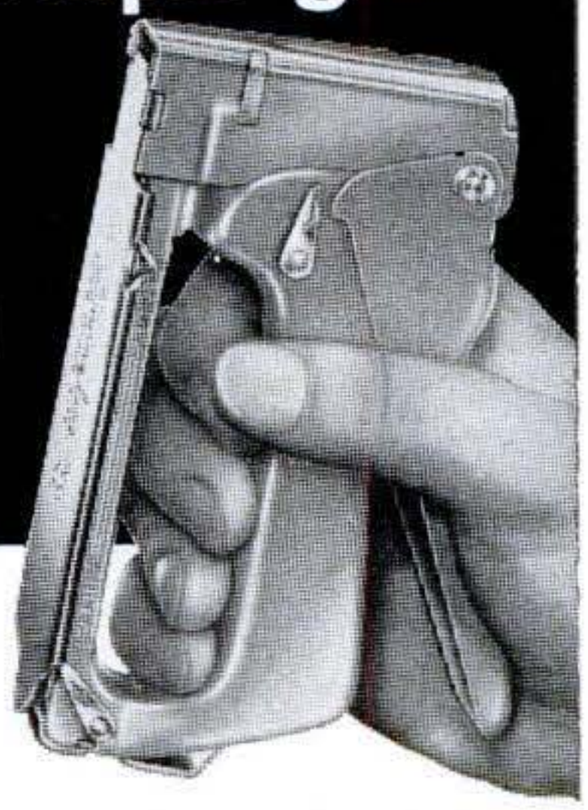

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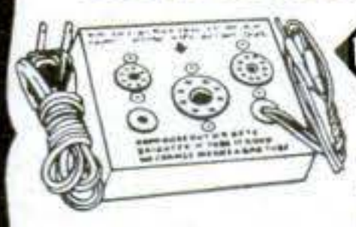

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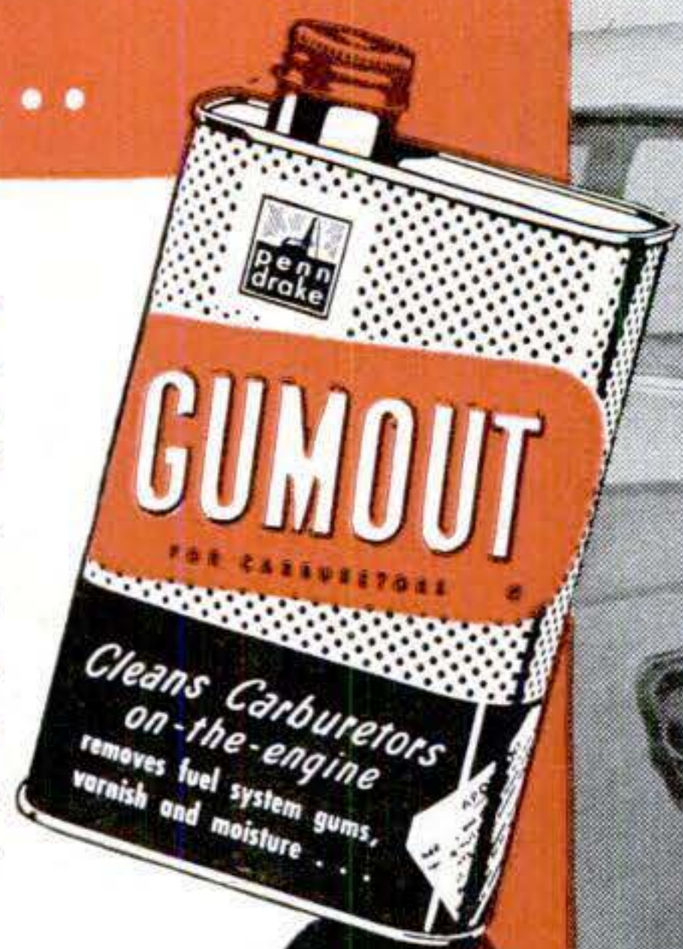

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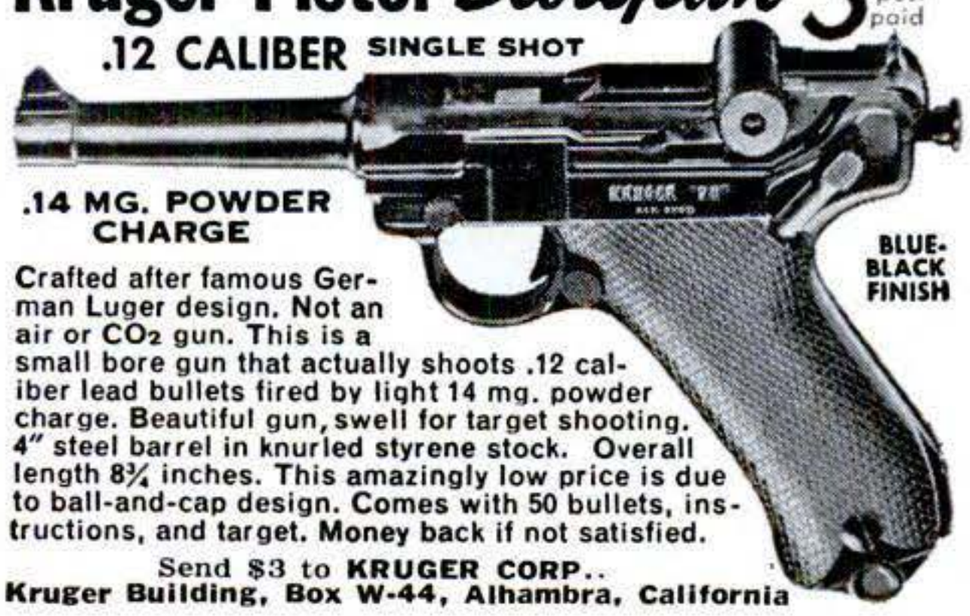

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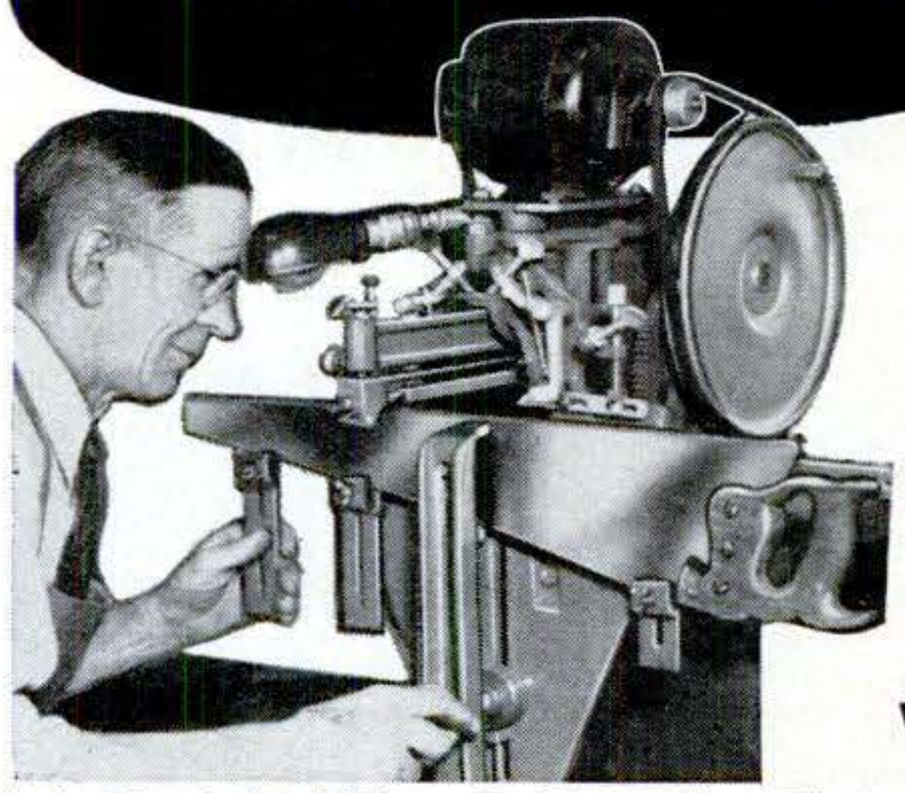

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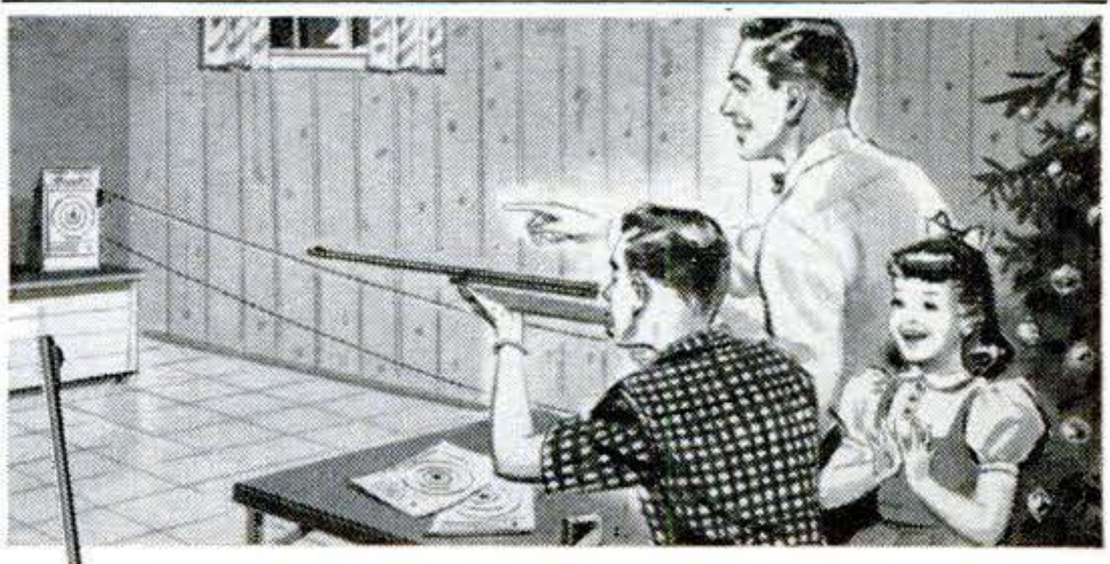

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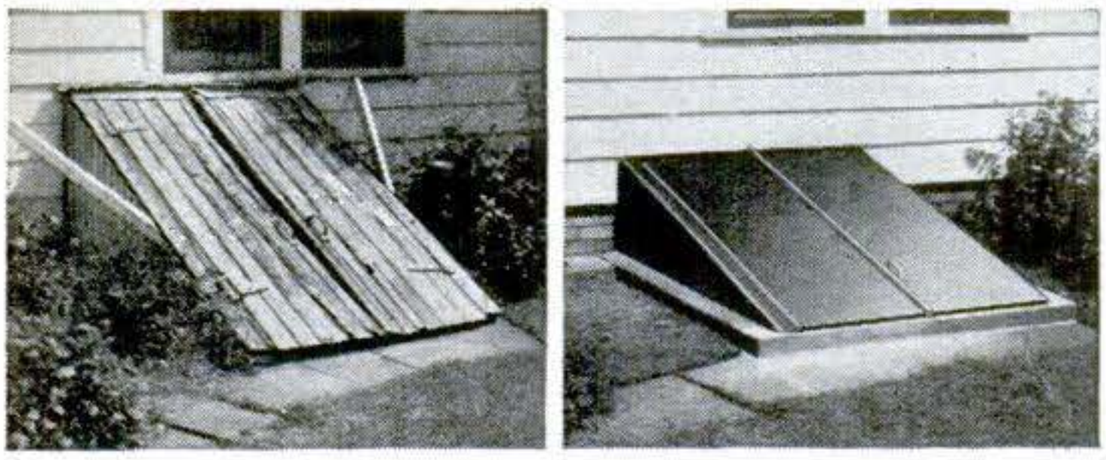

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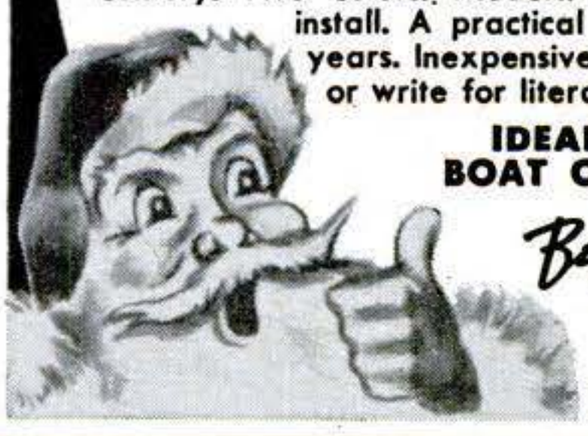

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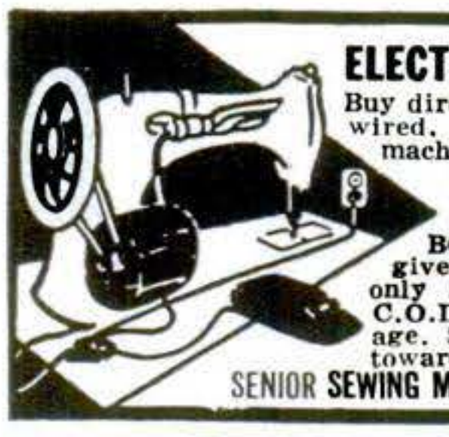

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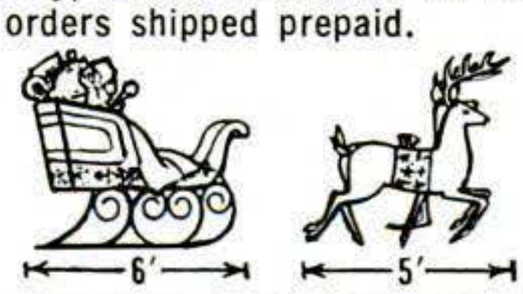

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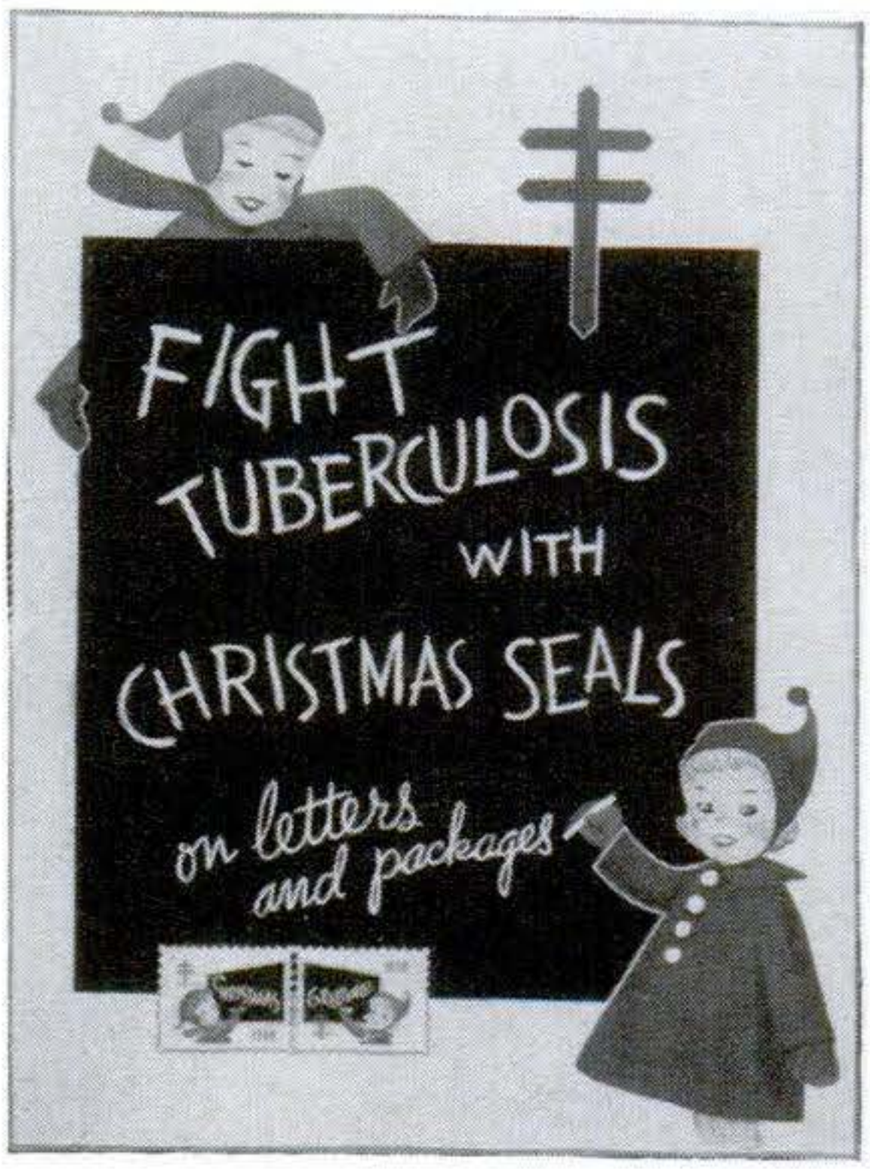

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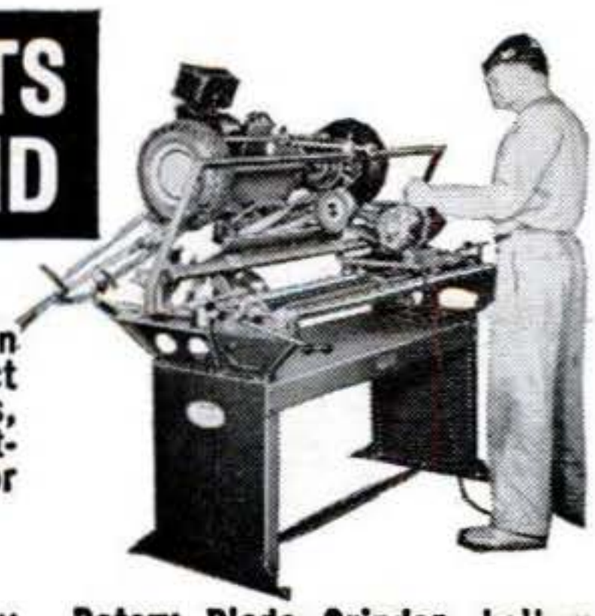

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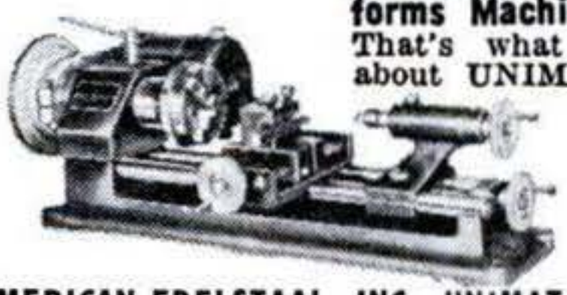

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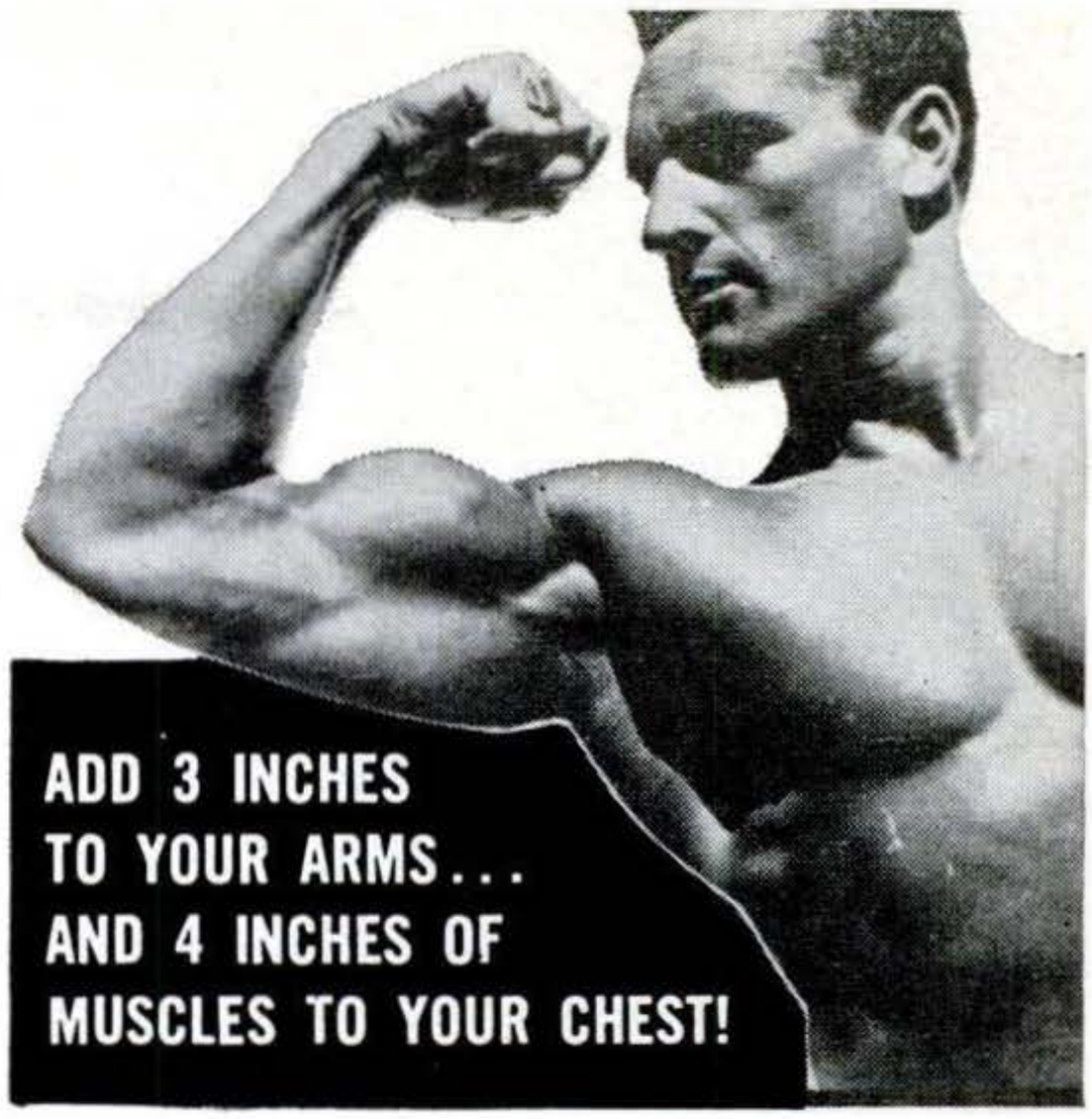

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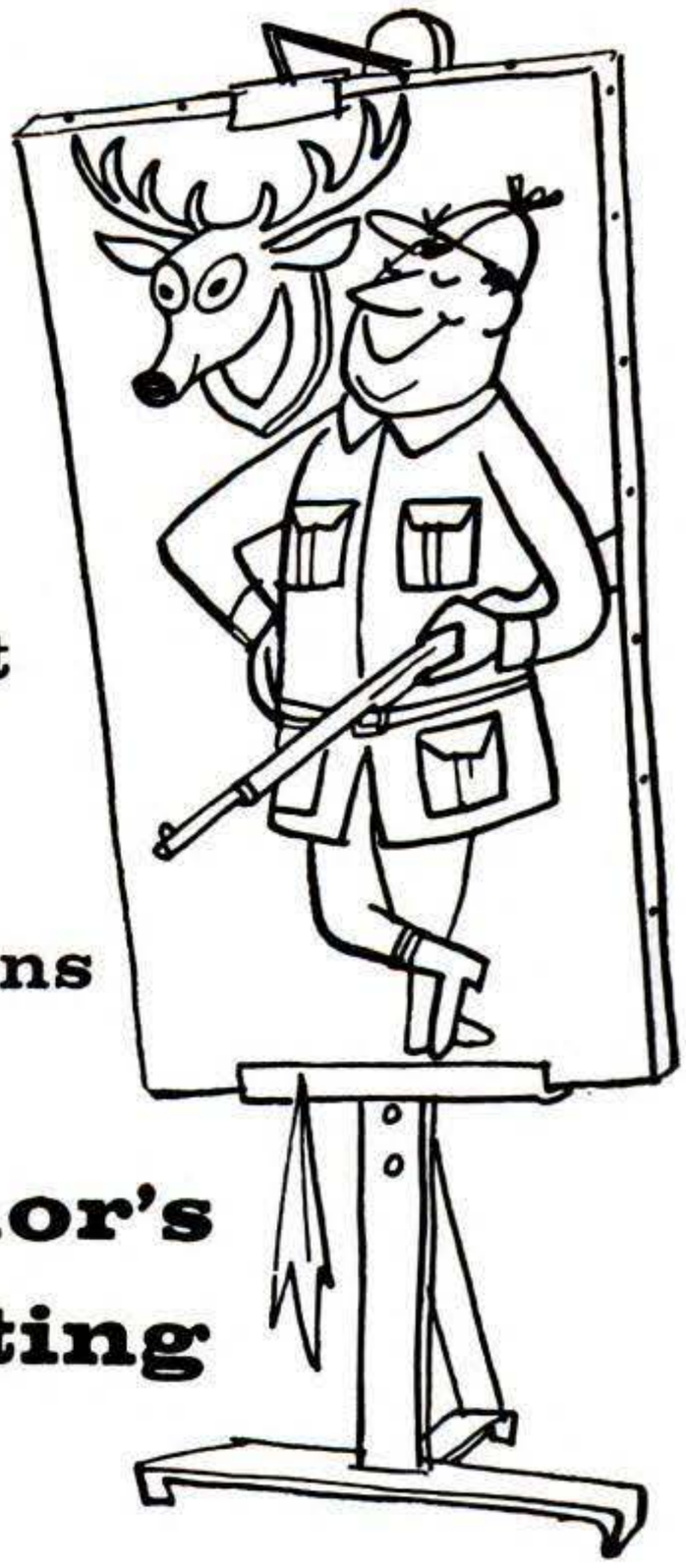

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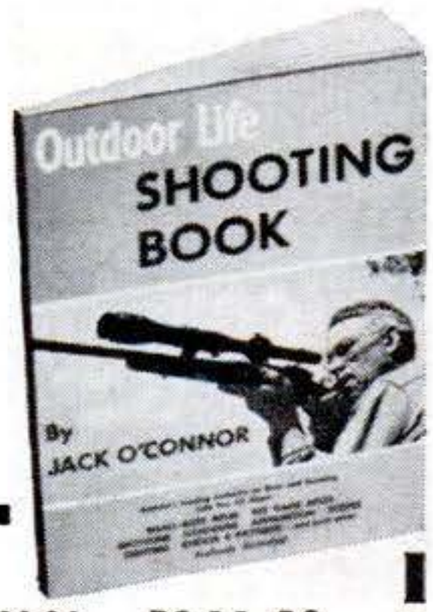

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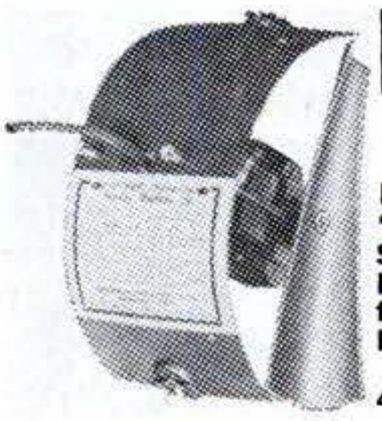

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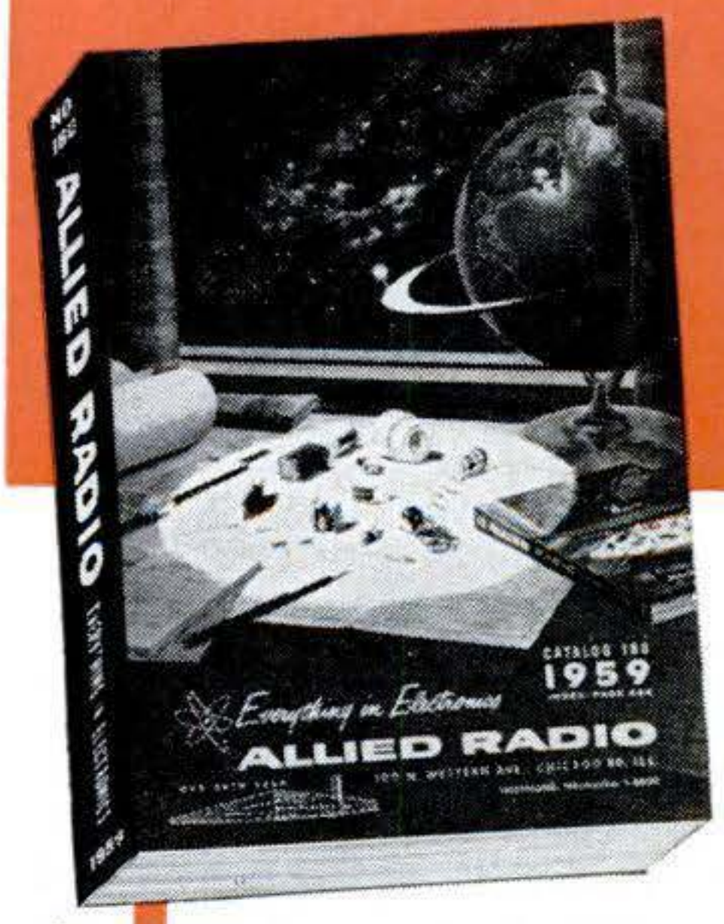

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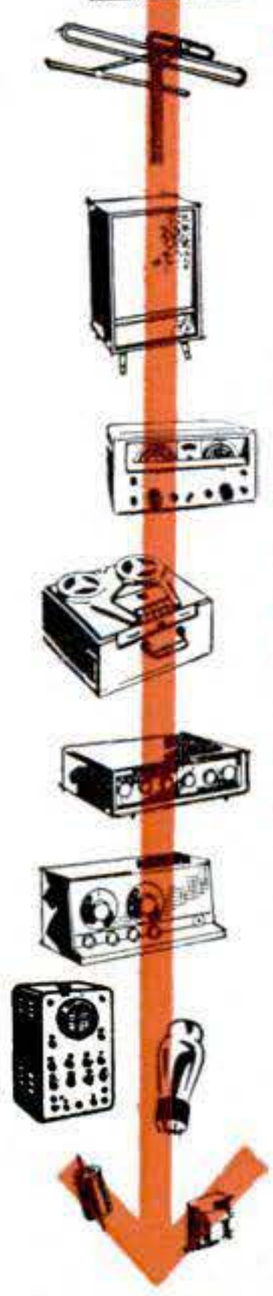

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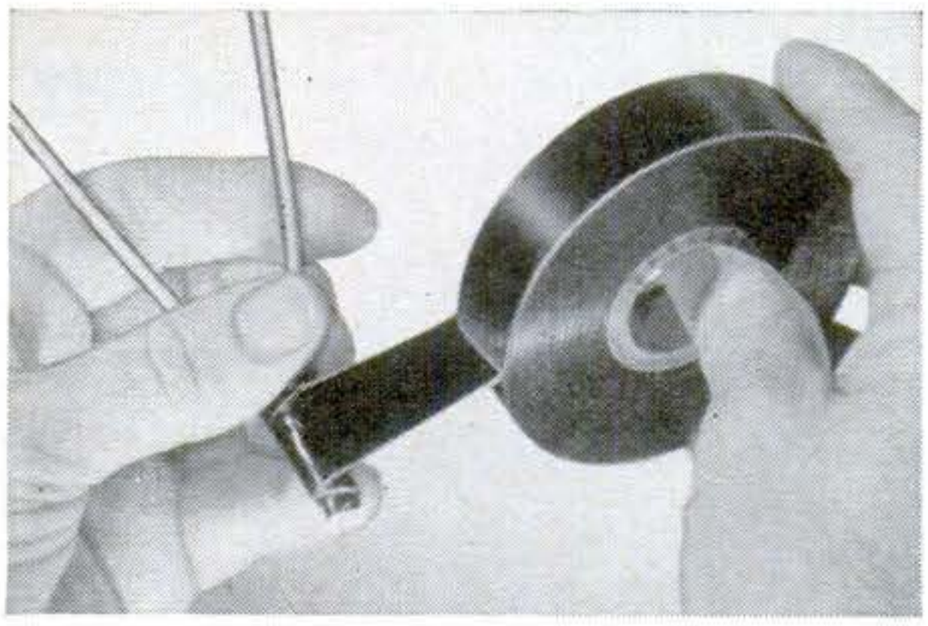

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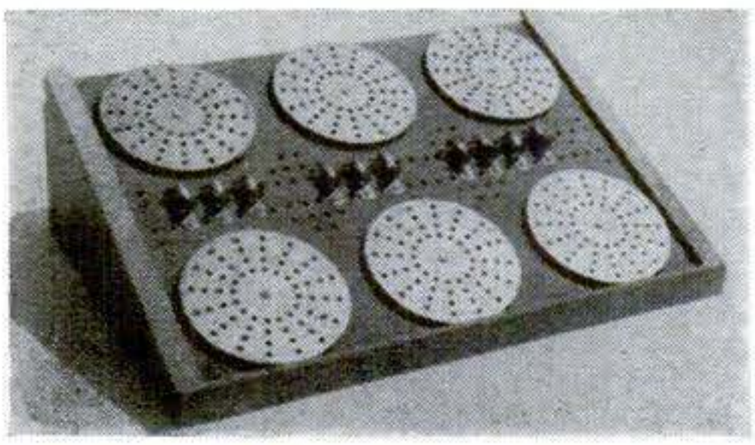

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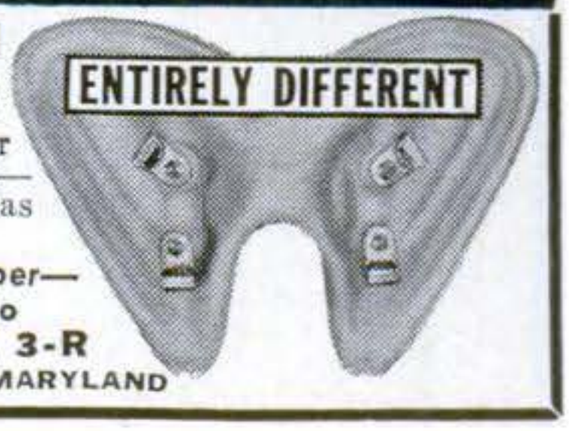

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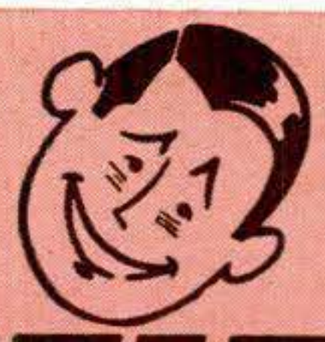

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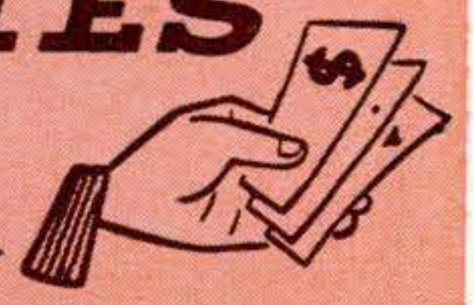

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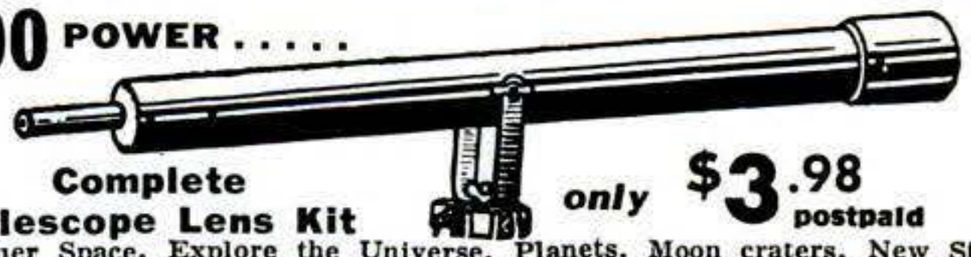

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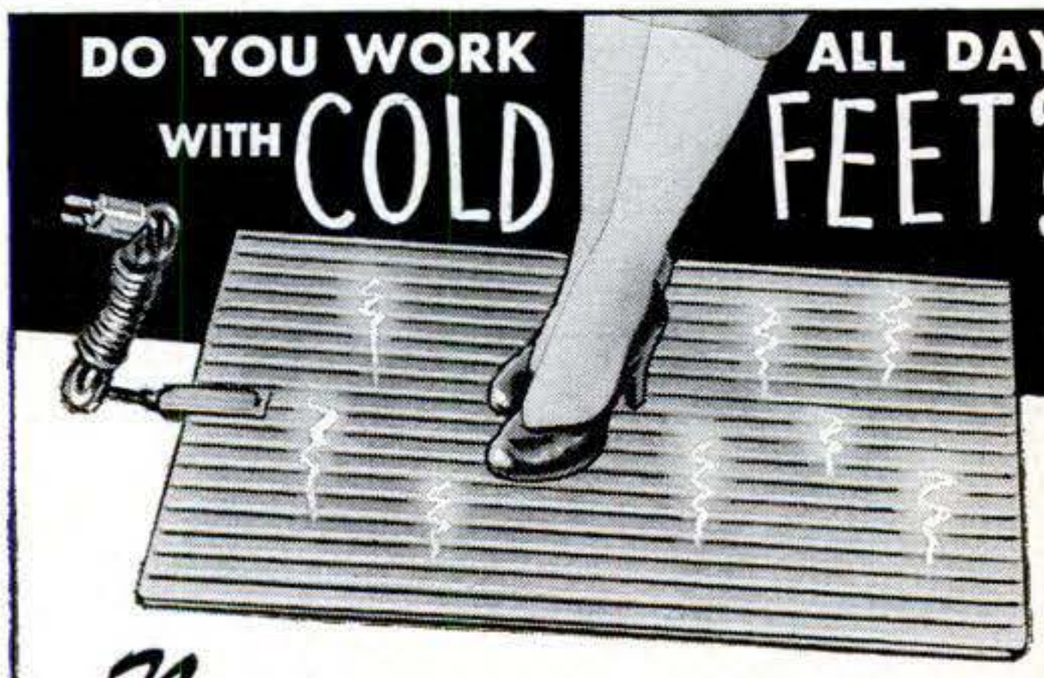

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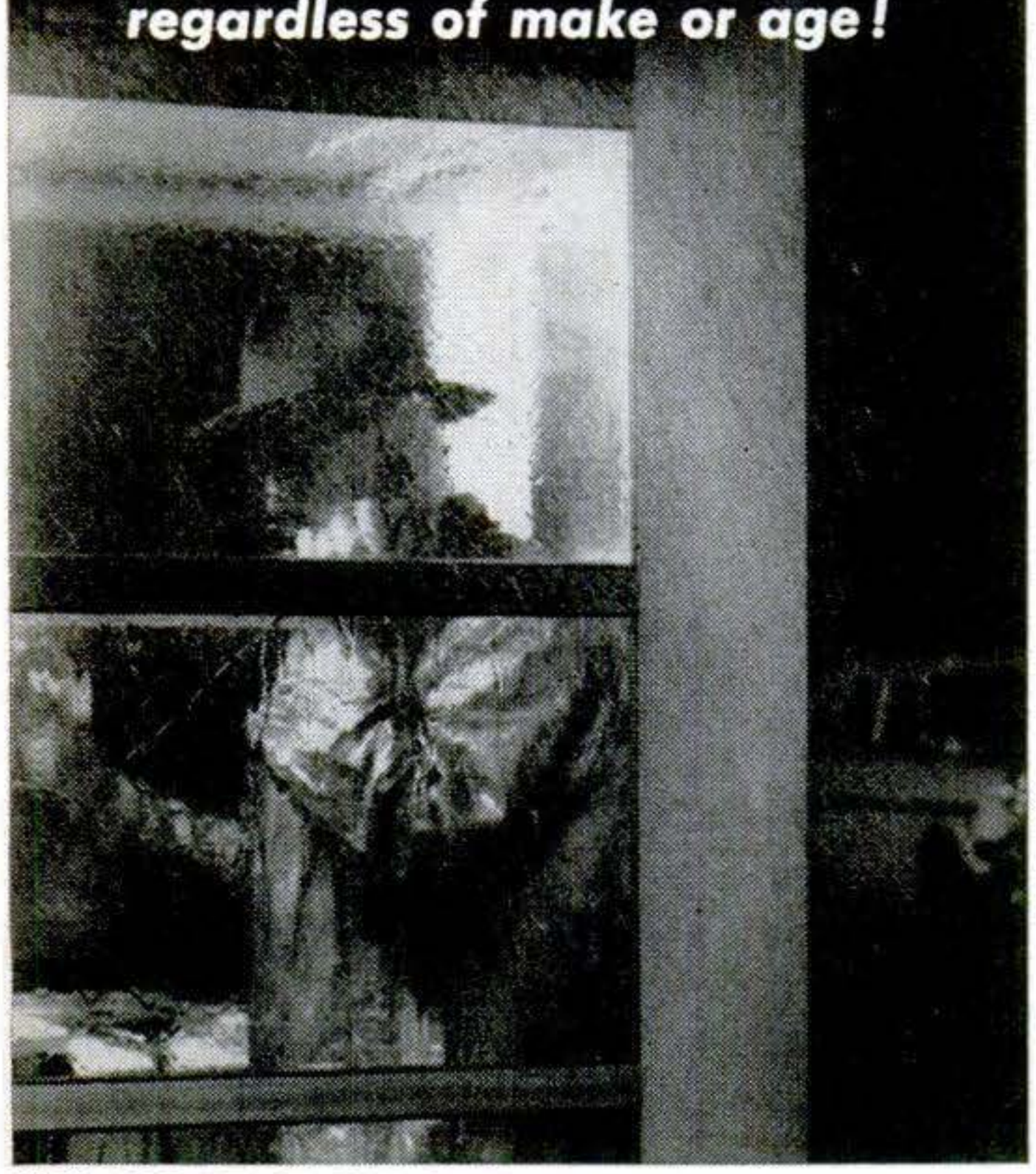

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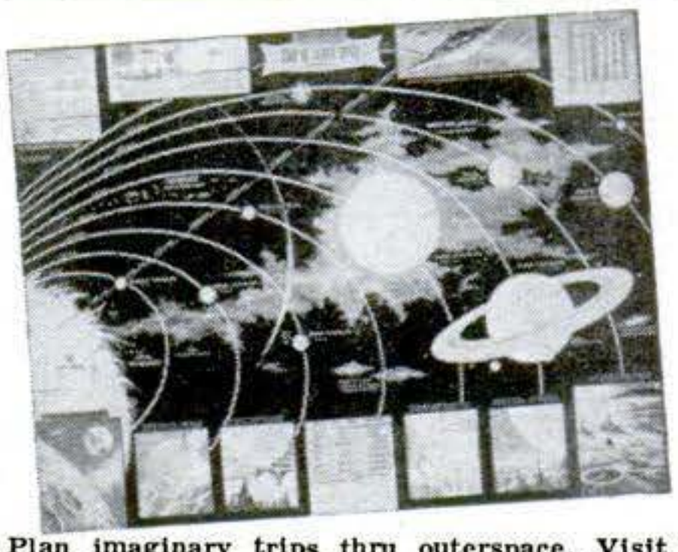

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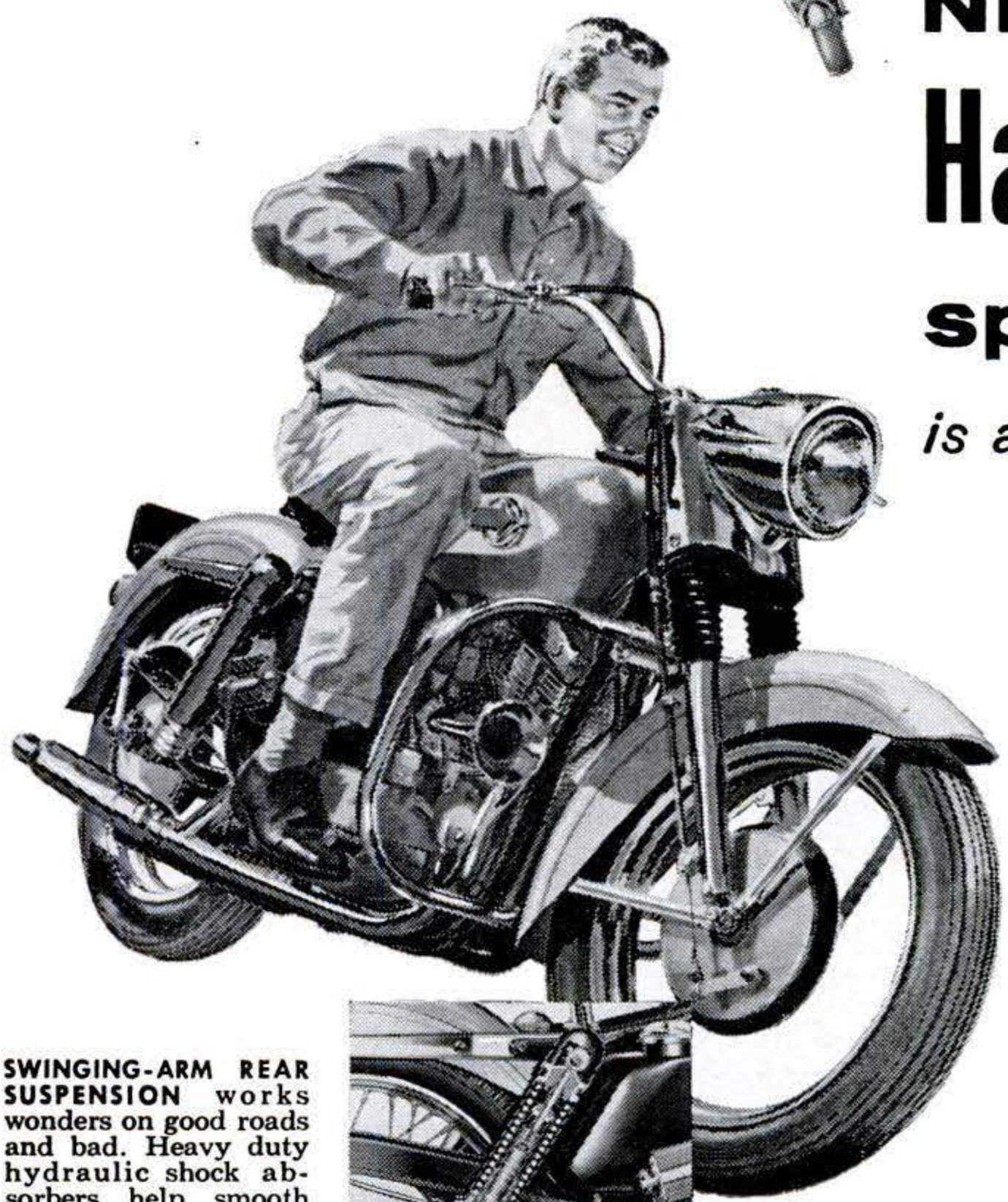

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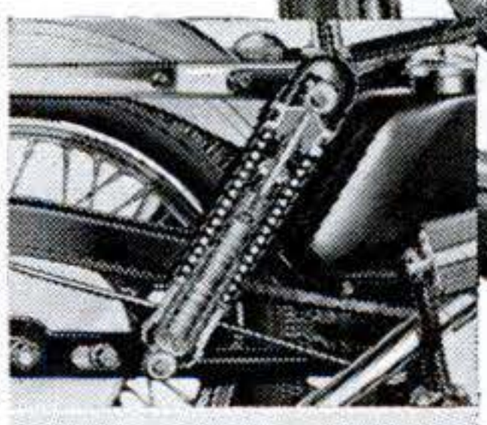

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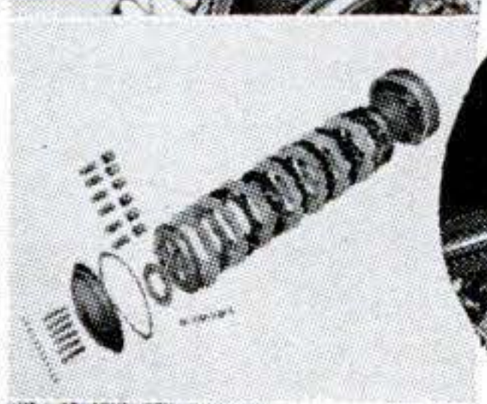

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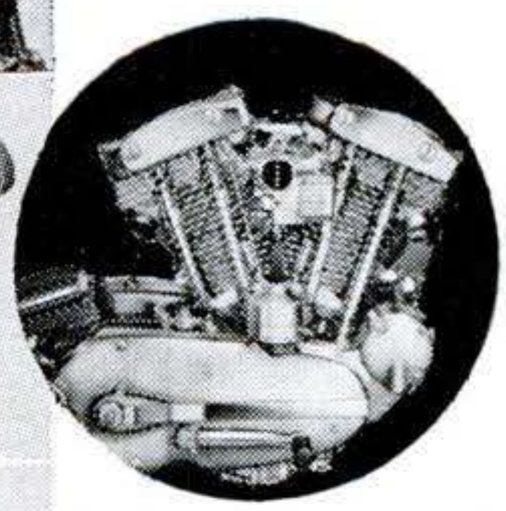

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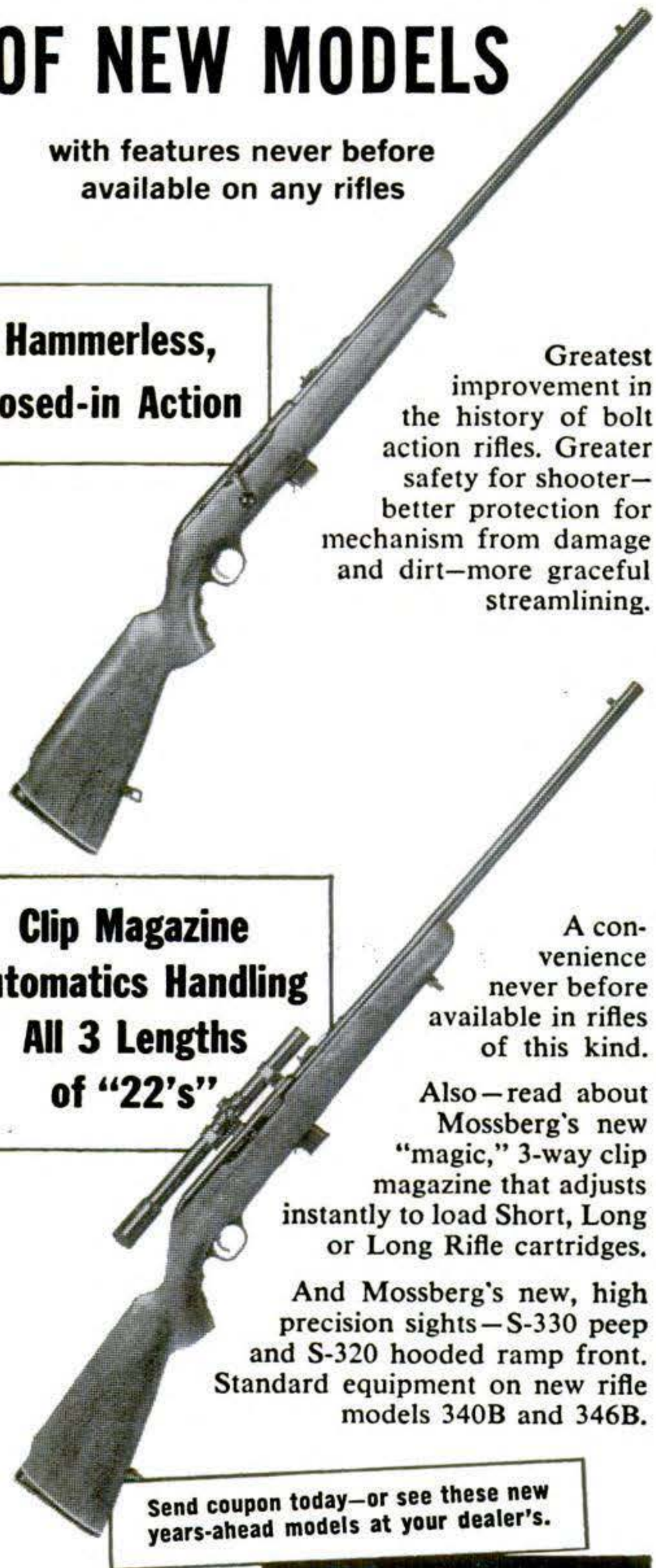

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The Dodge That Saved the Day...

Luggage packed, we were about to leave on a long-planned vacation when my wife yelled that water was flowing over the bathroom floor. A check showed that it was coming from the cold-water pipe under the sink. There was no valve to shut it off—the line ran directly from the cold-water main in the basement.

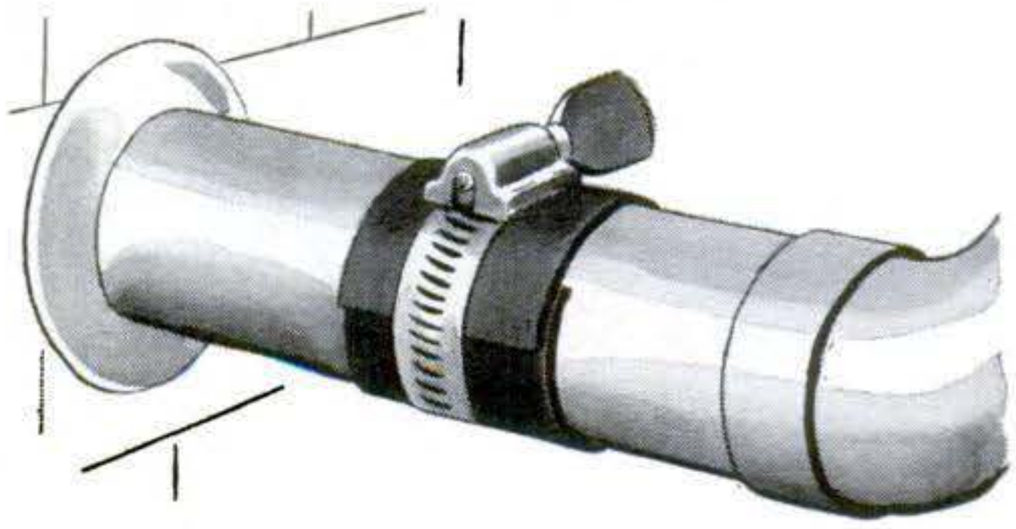
"We have an hour to make the plane," I said, "and not a hope of getting new reservations if we miss it. I'll just have to shut off the water at the meter."

"You can't," she objected. "The Smiths couldn't water our new lawn and shrubbery as they promised. In three weeks of this hot weather it'll be ruined."

She was right, and the Smiths' own yard hydrant was too far away.

I examined the leaking pipe closely; water dribbled from what looked like old wrench marks, eaten through by corrosion inside. To leave the water on would surely mean ruined walls and ceilings downstairs. In three weeks, the escaping water might even enlarge the break and turn the dribble into a gusher.

Then, 50 minutes from plane time, I got a last-ditch idea. Wrapping a bit of inner-tube rubber around the pipe, I cinched a screw-locking hose clamp over it. The dribble ceased, and we made our plane. That one-minute repair held until I put in a new pipe, six months later.—*Harold J. Winton, Pittsburgh.*



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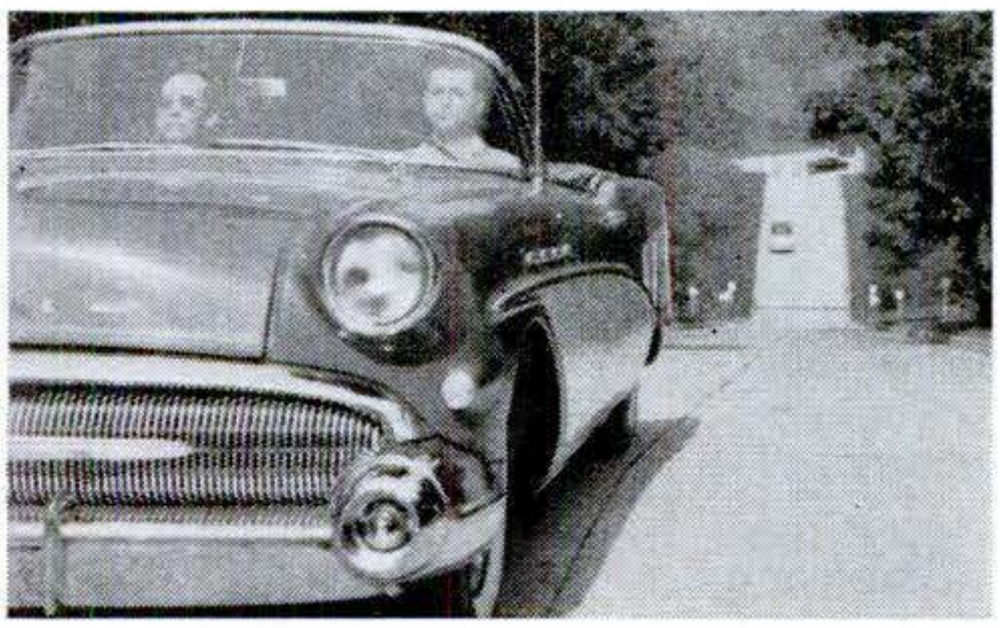

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Whether you drive in the wintry blasts of Alaska or in the arid regions of Arizona, your Rochester-GM Carburetor has been torture-tested in the lab, on the proving grounds and over thousands of actual traffic miles to assure dependable service. And your Rochester-GM Carburetor Specialist is factory-trained to keep this precision instrument in perfect adjustment for greater performance, greater economy. See him for the best results from your Rochester-GM Carburetor. *Rochester Products Division of General Motors, Rochester, New York.*

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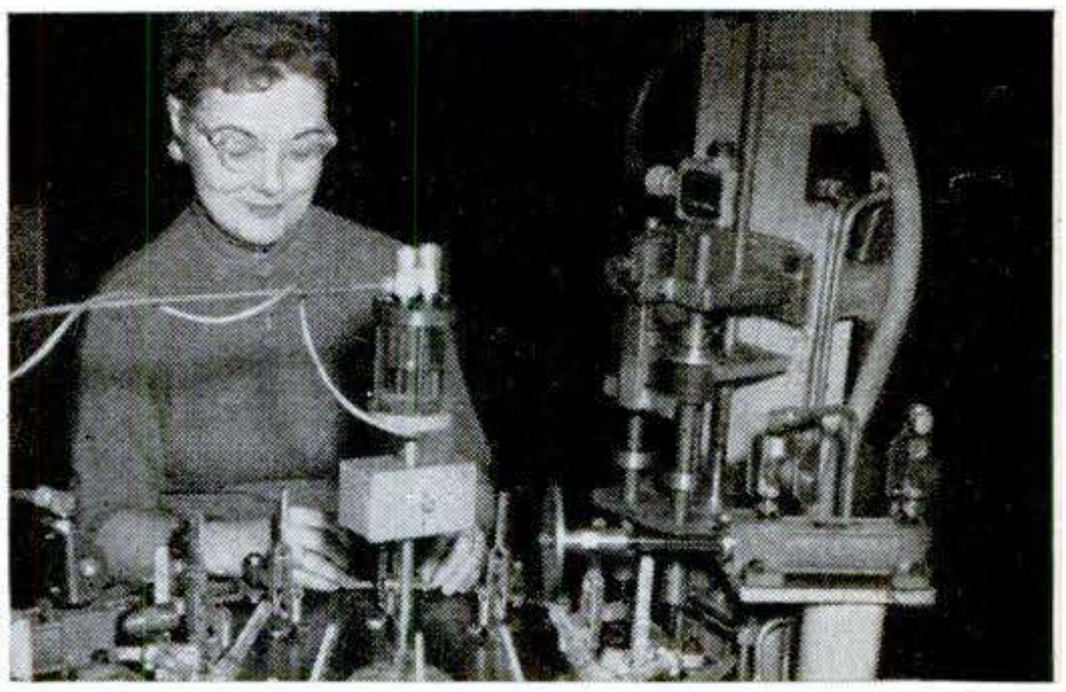

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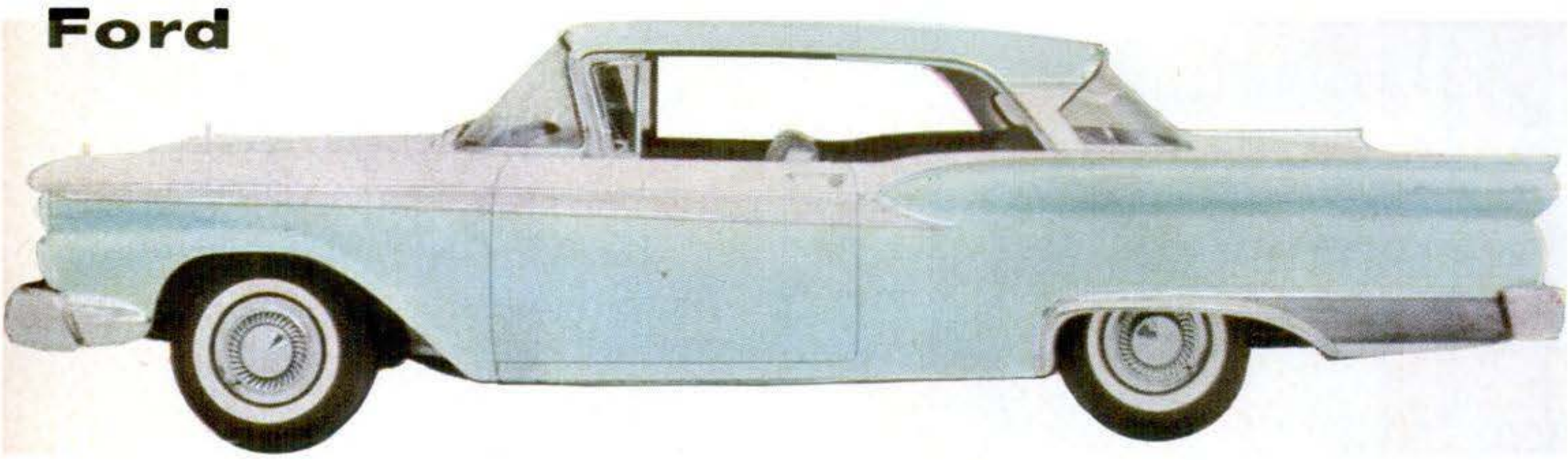
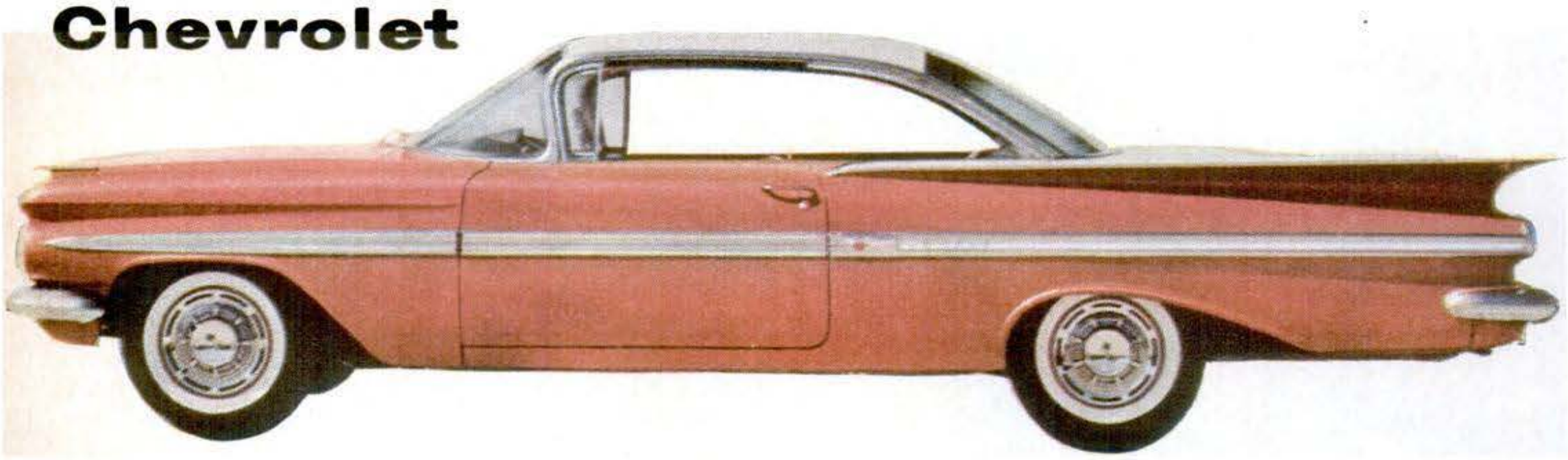
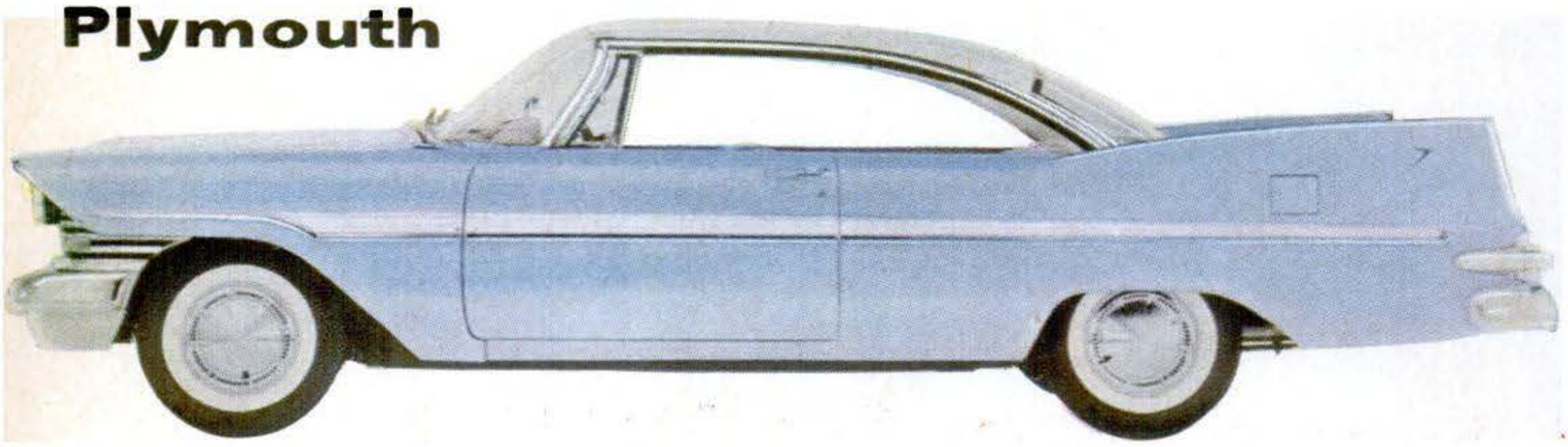
Comparing the Big Three for 1959

The "horsepower race" has become a "size race," with lengths exceeding those of the big luxury cars of 20 years ago







BOOSTED LENGTHS ON THE NEW CARS come mostly from extending rear overhangs. Lowered heights are result of thinner roofs, deeper foot wells. Chevrolet's seats are lower. Deck lengths are up—46 inches for Ford, 53 for Chevrolet, 44.5 for Plymouth—with bigger trunks.

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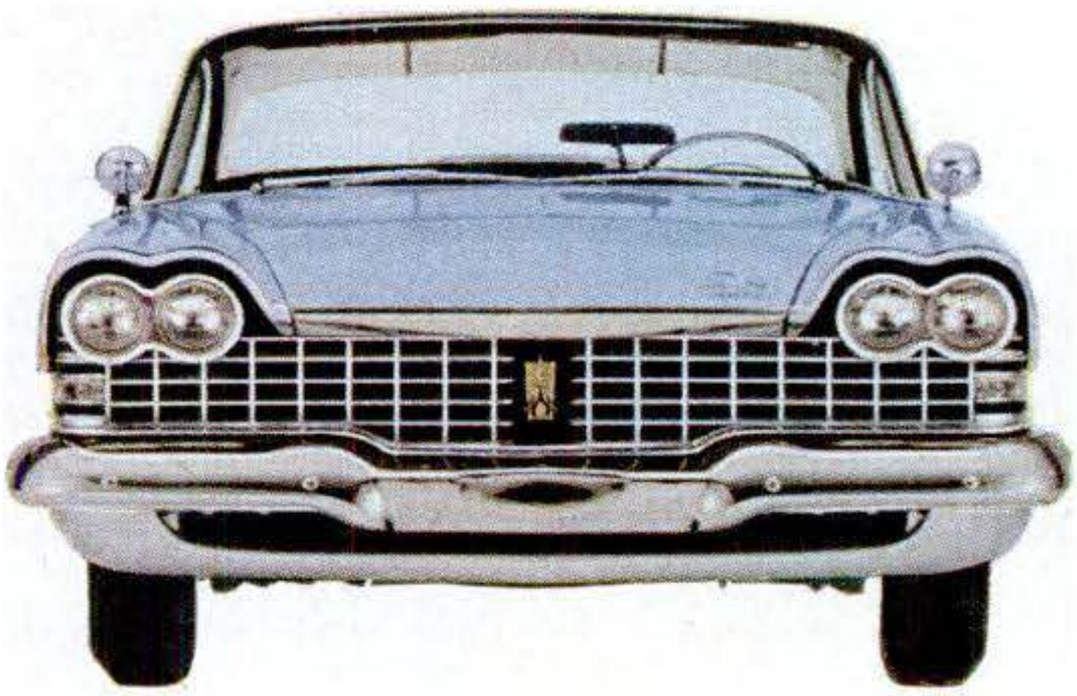
POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

By Devon Francis

WHEN the Big Three of U. S. motordom—Chevrolet, Ford and Plymouth—announced their gleaming 1959 wares last month, one fact stuck out: No longer is any such thing as a small car being made by a major domestic manufacturer. If yesteryear's "horsepower race" is over, Detroit has substituted for it a "size race."

At 17 feet, seven inches, the new Chevrolet is two inches longer than in 1958. At 17 feet, four-odd inches, so is the Plymouth. At 17 feet, four inches, the Ford has added an inch.

All three cars are wider, the Chevrolet by more than two inches, which brings it up to within three-tenths of an inch of the Cadillac. The Ford and Plymouth are



Fronts and rears are readily identifiable this year, not only from grille design but also from tail-light arrangement. Plymouth's egg-crate grille is made of extruded aluminum pieces riveted together. Biggest increases in head, shoulder and hip room are in Chevrolet.

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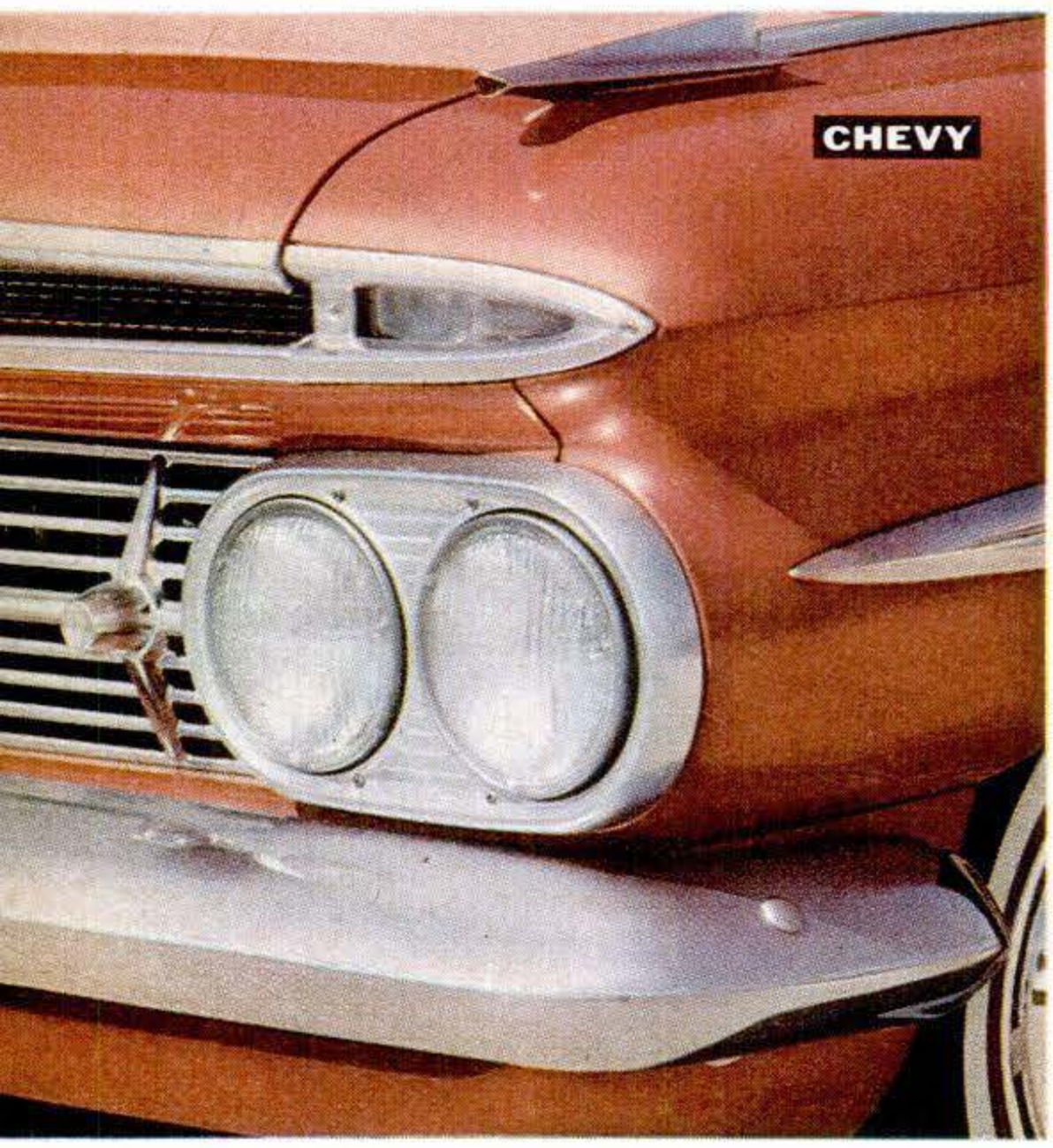

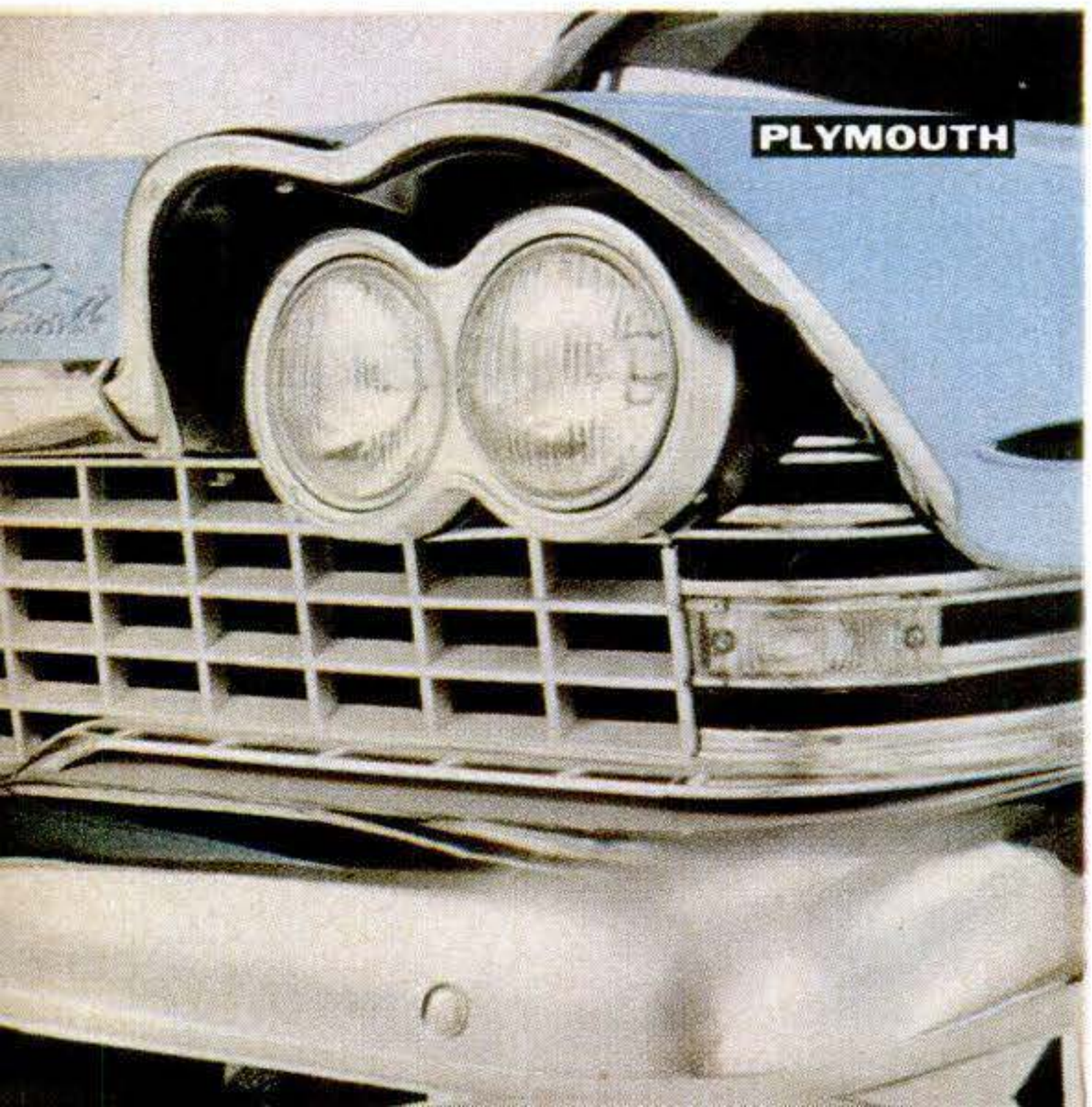

fractionally wider than last year's. The Chevrolet and Ford, again, are lower. Plymouth stands pat.

But that doesn't tell the story of the size race. To get that, you have to go back three model years. The Chevrolet is more than 13 inches longer than it was in 1956, the Ford 9½ inches and the Plymouth almost 3½.

The Chevrolet now is longer than a 1939 Cadillac, the Ford longer than a 1937 Lincoln Zephyr, and the Plymouth longer than a 1939 Chrysler.

All three of this year's cars are, of course, proportionately heavier than they were three years ago.

And they're considerably costlier.

What General Motors, Ford Motor and Chrysler Corp. have done to their erstwhile "small" cars has a deep significance for you as a car buyer. The factories reached some basic conclusions 2½ years ago when plans for the 1959 cars had to be made.

Those conclusions affect not only the 1959 crop of cars but the size, weight—and price—of cars for several years to come. Tools and dies are expensive. They must be used for a long time.

The conclusions reached in 1956 also are a big determining factor in Detroit's decision to plan its own version of "small" cars for introduction a year from now. These cars would indeed be smaller, lighter, simpler and more economical to buy and run.

First, let's take a look at the results of those 1956 decisions on the 1959 editions of the Big Three.

All three cars are splashy. The emphasis is on styling, and as between front and rear, most of the loving care has been lavished on the stern.

"You just catch a glimpse of front ends," explained one style authority, "but you're always looking at back ends whenever you go driving."

This unquestionably will go down as one of Detroit's major psychological breakthroughs for 1959.

The Chevrolet is positively startling in appearance. If the Buick's sailfish fins

DIFFERENT STYLING CONCEPTS are described in companies' own literature. Ford: "Quiet, beautiful, simple." Chevrolet: "Bold." Plymouth: "Dramatic advance in dart-line approach."

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[PS, Oct.] were an accident of gestation, then the dam of the Chevrolet must have been scared by a manta ray. The fact is, in its price class the Chevy establishes a new high in daring styling—and this is the second straight year of complete sheet-metal change. The beauty of the car's front end will supply no end of grist for conversation around the cracker barrel this winter.

The Ford is more conservative.

"The 1959 Ford," stated a Ford man with perhaps a touch of malice, "avoids a bizarre look."

Nobody at Ford was happy about the oblong tail-light clusters on the '58 car, and how they got that way is lost in the limbo of locked file cabinets. The result is that in '59 the stylists have returned to the big, simpler round lights of 1957.

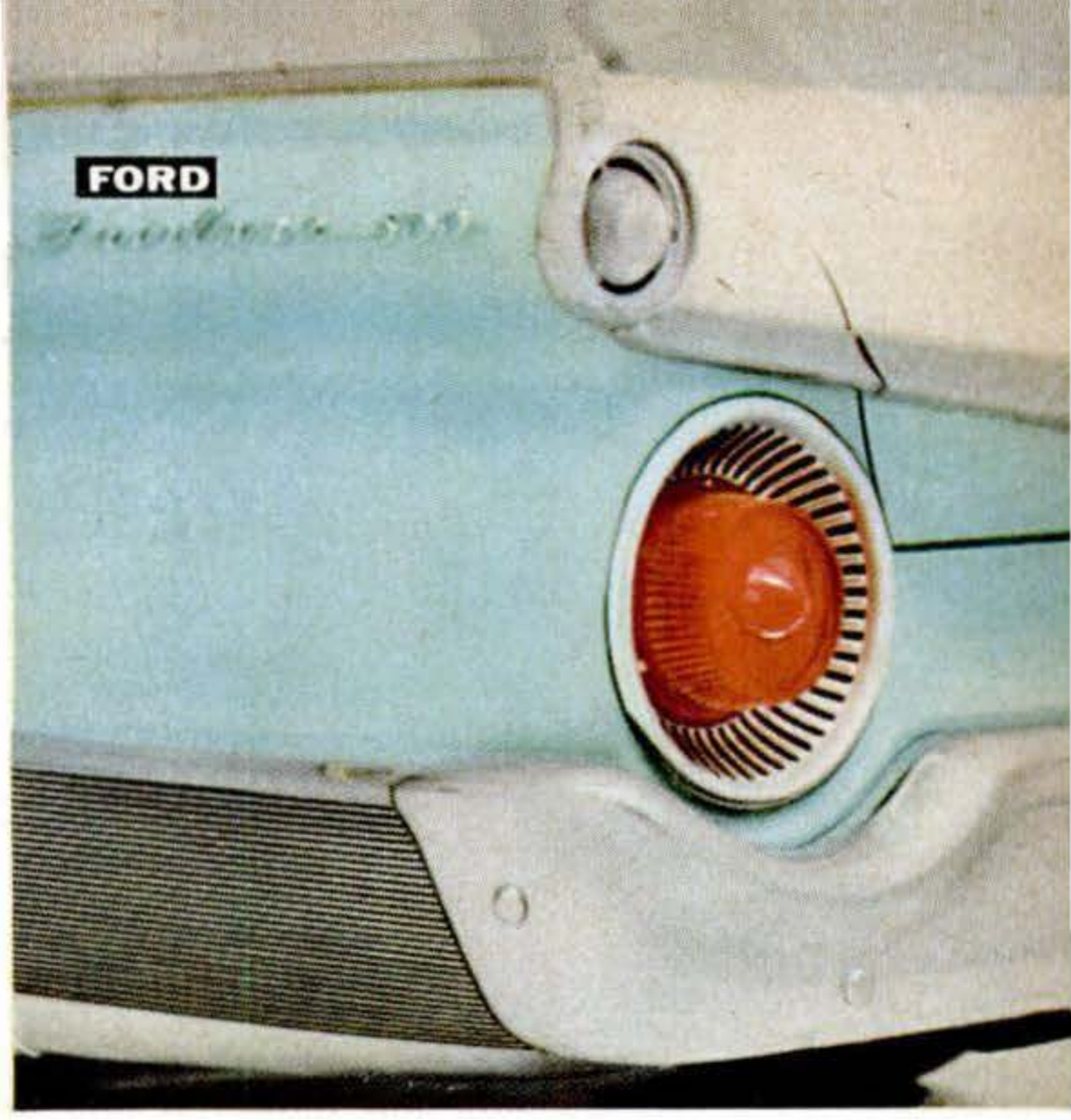
The Plymouth retains its dart or wedge look even though, like Chevy and Ford, it scarcely has a piece of sheet metal on it that is not dewy-fresh. The fins are brought forward into the basic sheet metal and have less of that afterthought look. Proscenium arches frame the tops of the four headlights.

In baseball parlance, the Chevy styling is out in left field, the Plymouth's in center and the Ford's in right.

Glass area is tremendous in all the cars. The Chevrolet has close to 7½ square feet more glass than last year. The bulk of this is in the pompadour, compound-curve windshield pioneered by Chrysler, and in the back window. Chevy's actual roof area is only 51.5 inches long. That compares with 64.5 inches for the Plymouth and 78 for the Ford.

The "greenhouse," as Detroit calls a car's passenger compartment, has become one in reality. Despite tinted glass, the sun beats in on all sides. Worse, with the windshield sloped at 45 degrees, it tends to reflect into the driver's eyes a mirror image of the shelf above the instrument panel. The only answer to that is to paint the shelf dead-black. That converts it into a heat-accumulator, storing the sun's infrared rays for transfer to the passengers.

While all three cars seek to bring in the



FORD'S RABBIT-EAR FINS have been modified to a ridge atop a slender boom. Chevy's wing-like fin is repeated in tail light. Rear end of the Plymouth's fin is now canted forward.

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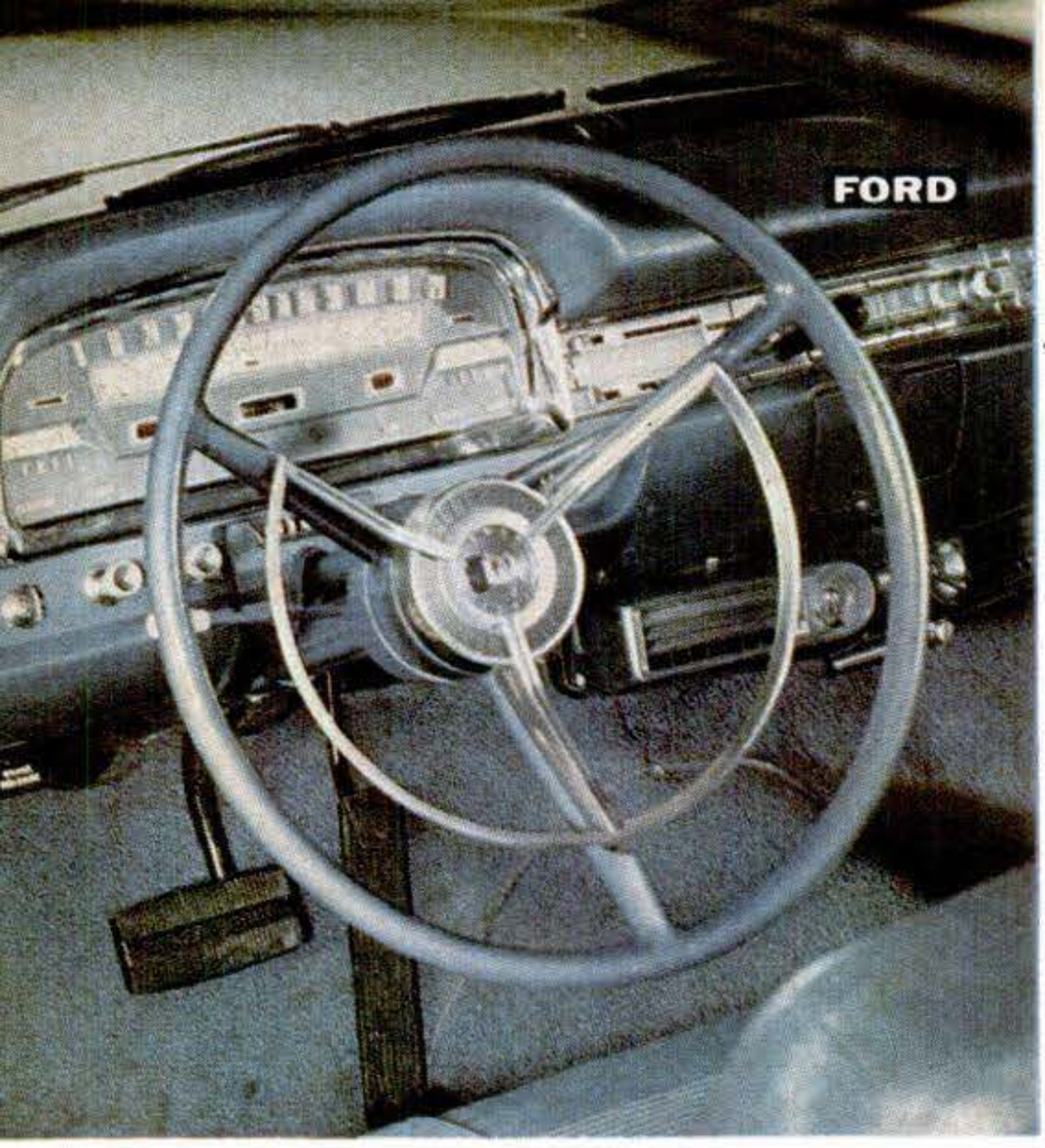

customers with looks, and mechanical improvements are secondary, there are some notable exceptions. The Chevy has a slower steering ratio for easier parking, bigger brakes and an improved scat transmission in its Turboglide. Suspensions are softer, frames sturdier.

Ford offers a new, two-speed automatic transmission, some 50 pounds lighter than the old Fordomatic. There's an optional limited-slip differential and a more responsive heater.

Like the rest of the Chrysler Corp. cars [PS, Oct.] the Plymouth has added optional air-springing for the rear of the car only, combined with regular leaf springs to prevent disaster in case of pump failure. Comfort and convenience items abound—swivel seats, automatic non-glare rear-vision mirrors and red-sensitive headlight dimmers that will respond even to the tail lights of the fellow ahead.

Horsepowers remain unchanged, generally, or have backed off from the figures that for years were so assiduously publicized by the company sales departments. Chevy has chopped 10 horsepower from its six-cylinder engine and added a smidgen to the torque. Only on a fuel-injection version with a hot cam has the output of the standard 283-inch engine been increased, and then only slightly. Last year's 348-inch engine now comes in more exotic versions with 300 and 315 horsepower.

Ford hasn't changed its engines one iota except to drop a four-barrel pot from its 332-inch offering.

Plymouth's engines remain substantially what they were except for the swollen 350-inch job, now up to 361 cubic inches. In that one, the horsepower remains at 305 but the torque is up 25 pound-feet for added zip at takeoff.

Compression ratios haven't been touched with a single exception: Chevrolet's boost from 9.5:1 to 10.5 for the fuel-injection job with the special cam.

Axle ratios are mostly unchanged except for Chevrolet, which has gone up a few notches for added performance but

UNDER NEW FORD PANEL is heater that regulates output by amount of air going through core. Chevy Impala horn ring has thumb tabs. Plymouth has pushbuttons for air and heat.

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less fuel economy. While all the manufacturers talk confidently of more miles-per-gallon, the amount of gas they will save in 1959 over '58 could be put in a thimble.

For what they are worth, in a day of declining interest in performance, here are the zero-to-60 accelerations of the three cars in four-door-sedan versions, standard engines and axles, and the simpler of their automatic transmissions, with two persons aboard:

Chevrolet: 11.1 seconds.
Ford: 13.1 seconds.
Plymouth: 12.5 seconds.

Those, in capsule, are the hardware packages. What caused them to be this way? Why so big?

Go back, again, to 1956, the year of decision. Detroit had just giddily wound up a fantastic production of more than 7,600,000 automobiles solely for domestic drivers. (In addition, several hundred thousand cars were shipped abroad.)

This was the millennium. The pattern of purchasing by U. S. motorists—including you—finally had been discovered. People tended to "upgrade" year after year, graduating from Chevies to Pontiacs, Fords to Mercuries, Plymouths to Dodges.

Chevy, Ford and Plymouth had been growing in size and luxury for several years, and here was a chance to expand their sales. Bent on deliberate destruction of the myth of the Low-Priced Three, they went at the job of self-improvement in earnest. They upgraded themselves. They got fancier. They cost more.

There was perfectly good reasoning behind this. In 1948, out of every 10 cars sold, only four were Chevies, Fords and Plymouths. By 1956, out of every 10 almost six were Chevies, Fords and Plymouths.

Meantime, the little foreign cars kept unloading at U. S. docks in slowly increasing numbers. But they weren't any worry. While they were enjoying a mere one percent more favor from the American motorist, the Big Three were 11.5 percent more popular than they had been

FORD WINDSHIELD is 20 inches high, 92 inches around at base. Same measurements for Chevy are 29¾ and 95 inches, for Plymouth 25 and 83 inches. All corner posts are narrow.

How they compare

The following figures apply to a four-door sedan, in each company's top line of cars, carrying a volume-production engine and an automatic transmission. All measurements are in inches except where otherwise specified.

		CHEVROLET	FORD	PLYMOUTH
HORSEPOWER		185[a]	240[b]	230[c]
PISTON DISPLACEMENT (cubic inches)		283	292	318
BORE AND STROKE		3.87x3	3.75x3.3	3.91x3.31
COMPRESSION RATIO (:1)		8.5	9	9
HORSEPOWER PER CUBIC INCH		.65	.82	.72
CAR WEIGHT PER HORSEPOWER (lb.)		21	15.2	16
MAXIMUM TORQUE (lb./ft.)		275	295	340
OVERALL MAXIMUM TORQUE MULTIPLICATION OF TRANSMISSION		3.82[d]	4.375[e]	4.472[f]
FUEL REQUIREMENT		R	R	R
STEERING RATIO (:1)	Manual	28	27	26.8
	Power	20	27	19.1
TURNING-CIRCLE DIAMETER, CURB TO CURB (feet)		40.2	40.6	42.2
BRAKE-LINING AREA (square inches)		199.5	180.1	184
GROUND CLEARANCE		6	6	5.4
WHEELBASE		119	118	118
OVERALL LENGTH		210.9	208	208.2
WIDTH		79.9	76.7	78
HEIGHT		56	56	56.6
OVERHANG	Front	32.6	34.2	33.1
	Rear	59.3	55.8	58.9
HEADROOM	Front	36.1	38.2	35.7
	Rear	34.3	37.3	34.2
SHOULDER ROOM	Front	60.5	56.7	60.5
	Rear	59.7	57	60.4
HIP ROOM	Front	66.1	60.4	63
	Rear	65.5	60.8	62.7
LEG ROOM	Front	45	44.7	45.5
	Rear	42.8	41.9	41.5

[a] Other horsepowers available: 135, 230, 250, 280, 290, 300, 315
[b] Other horsepowers available: 145, 205, 300
[c] Other horsepowers available: 132, 260, 305
[d] 6.91 transmission available
[e] 4.56 transmission available
[f] 5.39 transmission available

eight years before. This meant in numbers, in 1956, that while some 300,000 "small" cars—foreign and domestic—were being sold here, Chevy, Ford and Plymouth were selling 3,400,000 bigger-and-better and higher-priced vehicles.

Obviously, the public liked Chevies, Fords and Plymouths with a touch of mink on their trim, and was willing to pay the price for them. The little cars could have the crumbs from the table.

Mind you, this was the thinking back in 1956.

The model year of 1958 arrived—with cars that were designed back in 1955—and as the theatrical folk say, it laid an egg. Car buyers—including you, maybe—stayed away from automobile showrooms in droves. Detroit sold a half-million fewer cars in the 1958 model year than it did back in 1949—and 1½ million fewer than in 1956. The sale of used cars shot skyward—the factory blush was off of them, but they were cheaper. The rate of increase in the popularity of Ramblers and the foreign imports went up.

Prophets stalked up and down the land declaiming the merits of smaller cars and lower prices. The sun had set, they said, on the automobile as a display of "conspicuous consumption." Detroit was smitten on both cheeks, and smarted.

But those 1959 cars had long since passed the point in the tool-and-die factories where they could be recalled. They would arrive in the autumn of 1958 with the first frost. It takes 30 months to design and tool for new automobiles, and no pushing of the panic button could stop them now.

So, today, here they are, in all their size and finery. They symbolize Detroit's dilemma. And it's the U. S. motorist's dilemma, too. Was your resistance to the blandishments of 1958's handsome new buggies due only to a year-long business recession and a native caution about signing a long monthly payment contract? Or is it a permanent protest against rising prices? Or size?

If price is the problem, how account for the fact that Ford can't fill its orders for Thunderbirds at $4,000-odd a copy? How account for your preference for Chevrolet Impalas, Ford Fairlanes and Plymouth Furies, all equipped with expensive automatic drives and station-seeking radios, over the Plain Jane mod-

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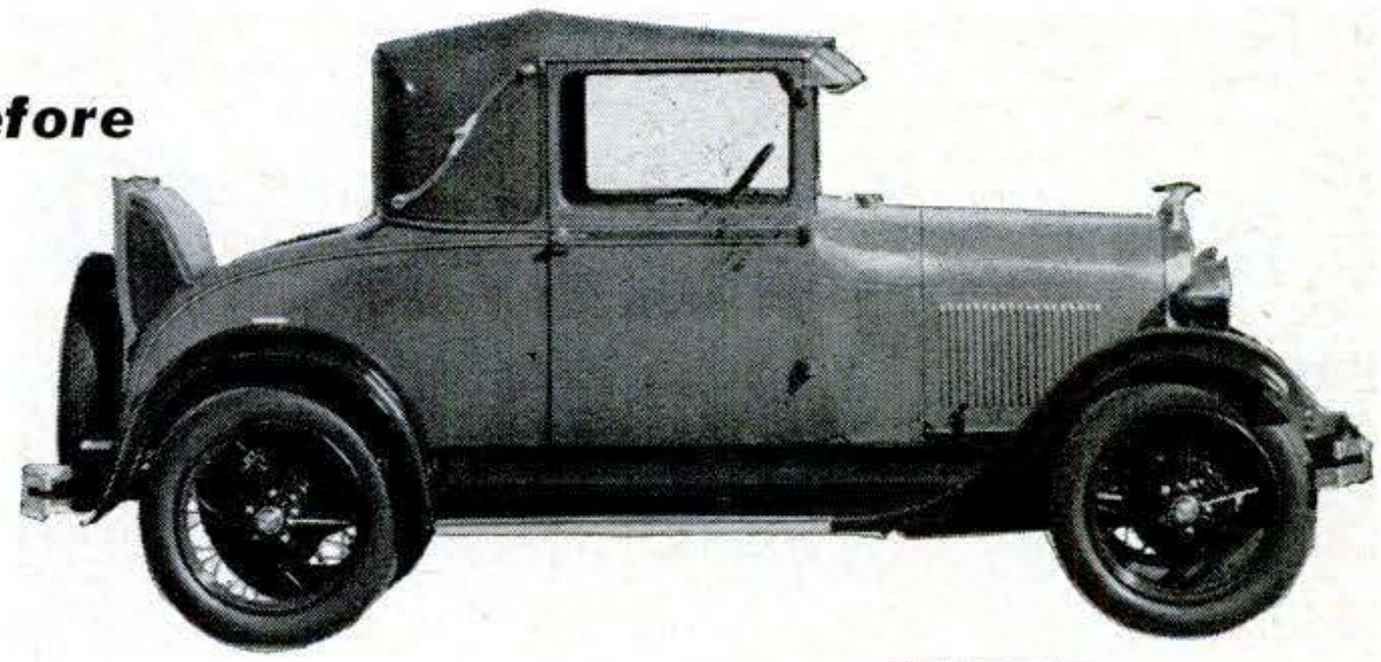
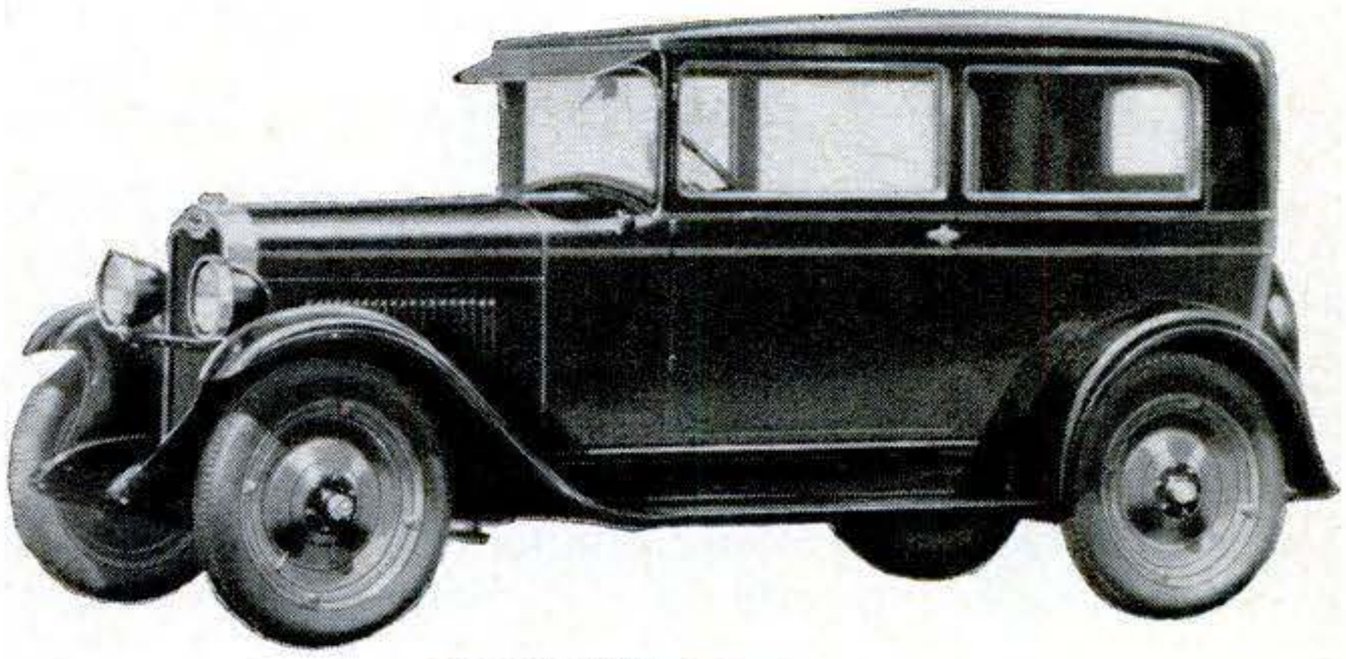
30 years ago: the Big Three before they got so big



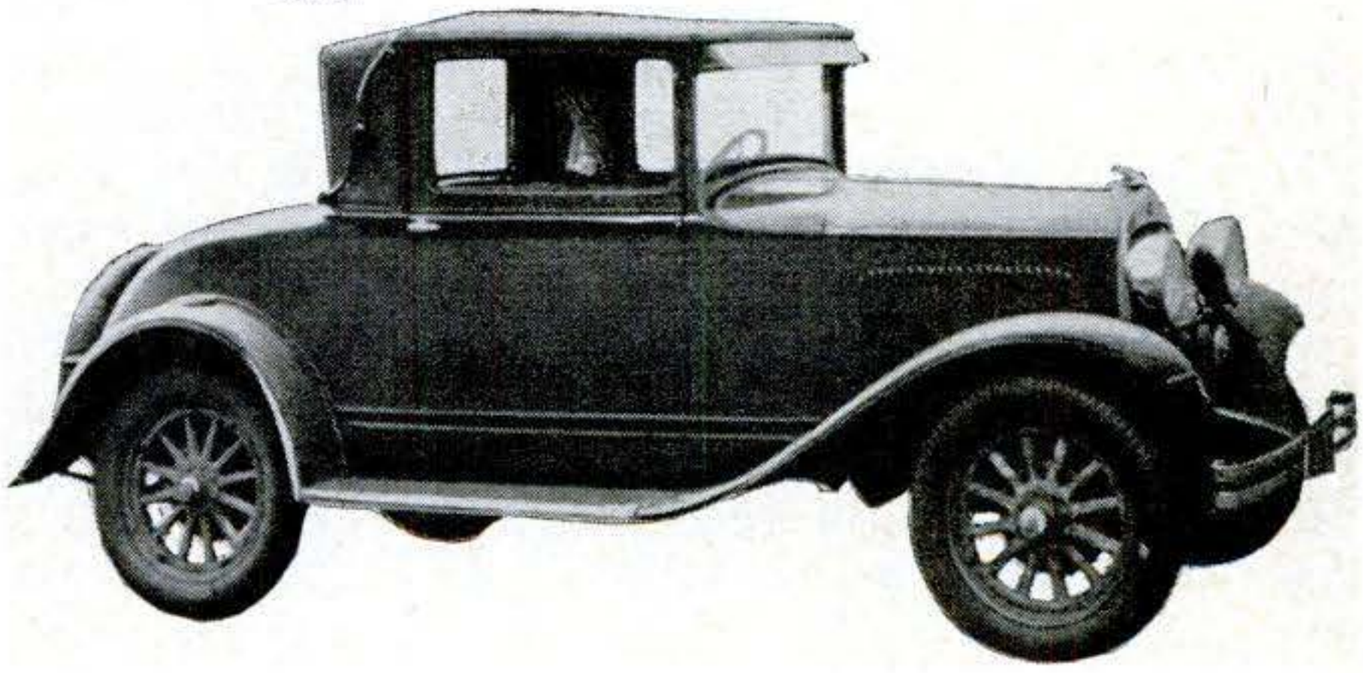
FORD

Length ..... 155.9 in.
Width ..... 65 in.
Height ..... 71.1 in.
Horsepower 40
Price $495



CHEVROLET

Length ..... 152.1 in.
Width ..... 66.5 in.
Height ..... 72 in.
Horsepower 35.5
Price $595



PLYMOUTH

Length ..... 167.4 in.
Width ..... 66.2 in.
Height ..... 70.5 in.
Horsepower 45
Price $675

els with six cylinders and manual shifts?

If it be size, how account for the fact that Plymouth station wagons, almost as long as plush Chrysler New Yorkers, are selling at twice the rate of the industry? Plymouth's wagons constitute 28 percent of its entire output; the industry's as a whole is 15 percent.

All this bewilders and worries Detroit. For, in the face of falling sales, what does it matter whether Chevy, Ford and Plymouth get 60 or 70 or 80 percent of the market? To reduce it to an absurdity for emphasis, 80 percent of nothing is nothing.

But Detroit is making an educated guess that its 1956 conclusions were correct, that it's on the right track in luxury, size and price. In two months it will have its answer. Each 10 days the factories collate their sales figures—they keep that close a count on the public's pulse. By late December they will know whether, back in 1956, they were wise, or they goofed. Two months' sales usually set the pace for the rest of the model year.

Meantime, they're hedging. Tools and dies are being made for Detroit's version of "small," less expensive, less ornate (and, bear in mind, less profitable) automobiles. These can be put on ice, or even sent to subsidiary factories abroad, if the new editions of the Big Three prove to be as popular as their manufacturers hope. But if the bigger-better-costlier cars lay another egg, you'll see the smaller ones in the showrooms of Automobile Row late next year. END

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Taking the Trickery Out of Tire Ads

By Robert Gorman

New rules against deceptive labels, double-talk guarantees, and phony "sales" will help you get more for your tire money

FOR a couple of months now, tire advertising has been going to the laundry. You still have to watch out for some pretty shady tactics, but now most ads give you a sporting chance to discover what's being offered for how much.

The machinery behind the cleanup is a new set of "Tire Advertising Guides" just issued by the Federal Trade Commission. In effect, it is a government battle plan against the rampant falsehoods, deceptions, concealments and misrepresentations that have cast a long shadow over the replacement-tire business.

Will the Guides mean an end to confusion about brands, prices, "levels," discounts, special sales, and sleight-of-hand come-ons? Probably not. Even with full industry cooperation it would take more than a government document to unscramble the bewildering and ever-changing factors that tire buyers—and sellers—have to live with.

What are the new Guides? Why were they needed? How much—and how soon—will they help you avoid buying pitfalls? Some of the key answers will be wrestled over by lawyers for a long time to come, but you can start using the Guides right now. To do so you should understand the practices at which they are aimed and some hard facts about the tire industry.

Who makes what

Tires are produced in the United States by 21 manufacturers and sold by an estimated 300,000 retail outlets. These include about 10,000 regular tire shops plus gas stations, mail-order houses, and hardware, auto-supply, department, and general stores.

At the manufacturing level the $2-billion-a-year industry can be roughly divided into majors and minors. The so-called "Big Five"—Goodyear, Goodrich, U. S. Rubber, Firestone and General—make all the original-equipment tires used on new passenger cars. They're also the biggest sources of replacement tires (1) under their own names; (2) through subsidiary manufacturing companies such as Kelly-Springfield (Goodyear); Fisk and Gillette (U. S. Rubber); and Hood, Diamond, Brunswick, and Miller (Goodrich); and (3) as suppliers of private-brand tires to wholesale distributors, service stations, chain and mail-order stores, and others.

The balance of the very substantial replacement market is shared by independents—Armstrong, Dayton, Dunlop, Gates, Lee, Mansfield, Seiberling, and many more. Independents share in the private-brand business, and many of them distribute tires under two or three different brands of their own.

This complicated—and bitterly competitive—trade structure has a direct bearing on the use of business practices that were never taught in Sunday School. When each brand is multiplied by two to four price and quality variations, you end up with a wild array of names and claims from which it's nearly impossible to sift the important facts.

To make it still harder for you to penetrate to the truth, a good many manufacturers and dealers have made free use of

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Can you read tire advertising?
This dummy ad illustrates some of the typically misleading claims outlawed by the Tire Advertising Guides recently issued by the Federal Trade Commission

Tire Sale

45% OFF

Save on the tire designed for
ORIGINAL EQUIPMENT
on millions of new cars!

PRICED NOW . . . FIRST AND ONLY TIME
for Our Opening Week - Reg. Price $30.50

SIZE 6.70x15
BLACK TUBE TYPE
UNLIMITED QUANTITIES

$14.79 PLUS TAX

Safest Tire Ever Made!

SKID-PROOF • BLOW OUT-PROOF • PUNCTURE-PROOF

FAMOUS MAKE
NATIONALLY ADVERTISED
FIRST LINE • 100 LEVEL

TIRE & TUBE 6.70x15

Unconditional Guarantee!

13.79 PLUS TAX

Size	Blackwalls Man. Sug. List	Blackwalls Tire and Tube	Whitewalls Man. Sug. List	Whitewalls Tire and Tube
6.70x15	36.10	13.79	43.25	19.79
7.10x15	39.60	17.84	47.50	20.81
7.60x15	43.10	19.83	52.10	23.84
8.00x15	48.20	21.81	56.85	25.82
8.20x15	50.05	23.82	57.95	27.81

NEW TREADS **8.88** Plus Tax

Unconditional GUARANTEE! 6.70x15

ODD LOT!

- Save on Changeovers!
- Save on Special Designs!

All in Good Condition

6.40x15
6.70x15
7.10x15
7.60x15
8.00x15

ALL SIZES **5.99** NO TAX

With your old tire regardless of condition

Whitewalls Slightly Higher

DECEPTIVE TIRE CO.

Off what? Price comparisons that tend to mislead are not allowed

Meaningless and untrue claims are ruled out

Terms that imply standards must say who sets them

Sounds great but doesn't mean a thing. Guarantee terms must be clearly stated

Current O.E.? If not, the last year of use should be stated

Your "saving" is fictitious and deceptive: these tires have never sold at "regular" price

Safety and performance claims must mean exactly what they say: these don't

Labels for retreads mustn't disguise the fact that casings aren't new

Comparisons with phony list prices are taboo; manufacturers should stop "suggesting" prices that nobody actually pays

Used and obsolete tires have often been described this way. A real "changeover" is a current O.E. tire with insignificant use

misleading titles and price tags. These —and a few other forms of tricky advertising—are the main targets at which the FTC has now drawn a bow.

Grade descriptions

Descriptions such as "first line" and "100 level," says the FTC, should not be used without "conspicuous, clear, and truthful disclosure of the meaning thereof."

Do these designations have any "truthful" meaning? The answer is Yes, but not too much and probably not what you think: If a manufacturer actually does maintain consistent quality standards, he may use the "first-line" label for the best tire he makes exclusive of those with extra-cost premium features.

Thus for the five brands that supply Detroit's needs, first line should mean original-equipment quality as established by car manufacturers' specifications. For all other tire brands the term can "truthfully" represent almost anything the brand owner decrees. Many independent first-line tires are every bit as good as original equipment; others are two or three rungs lower in materials and construction standards.

Under the new Guides, therefore, an ad that mentions a tire's "line" is supposed to let you know who sets the standards. "Joe's First Line First Quality" may really be a fine tire at a bargain price. But if you don't know Joe, all the label proves is that his best tire is generally round and holds air.

Unlike "lines," tire "levels" once had some official standing: They're a throwback to price schedules set by the wartime Office of Price Administration. OPA used the retail price of original-equipment replacements as a base and called it "100 level." If a manufacturer asked half again as much for a tire (presumably his "premium"), it automatically became 150-level. Lower-priced tires were scaled down proportionately to 90, 80, 70 or some other number based on a relationship to 100-level.

Even when it meant something, therefore, tire level was based solely on manufacturers' price tags—which in themselves were sometimes a source of deception.

"List" prices and discounts

Countless millions of tires made to sell for $12 have been bought for $12 or more by people who thought they were getting $30 value. Now, in a rule that may echo through many other types of business, the FTC is attempting to eliminate fictitious list prices on tires. If it succeeds, it will raise hob with Smiling Sam's bargain ads.

Inflated list prices are a staple of the tire trade and part of the calculated deception about lines and levels. They obviously make it easier for unknown brands to compete against those with greater public acceptance, since a $30 list helps foster the illusion that your $15 tire is really first-line quality.

Pricing shenanigans also lend themselves to deceptive "Two-for-One" claims, "One-Cent Sales," and bold promises of "50 percent off." The usual gimmick is that you have to buy one or more tires at the "regular list price" to get another one at cut price.

In their worst form, advertised prices have been used simply to lure you into the store. When you respond to the bait you may be told the store has run out of your size, or that the offer applies to a much shoddier tire than you thought.

The FTC is now trying to box in all these common practices. An advertised price, say the Guides, "should be the bona fide actual selling price" of a tire the dealer has in stock and wants to sell.

Deceptive designations

Another blockbuster dropped by the FTC may ultimately blast fancy titles off half the tires on the road. It's an axiom of the business that the classiest names are

Got Any Complaints About Tire Ads?

To ACT against deceptive advertising, FTC lawyers usually need evidence that someone has been deceived. So if you've been taken in by tire claims, send them the facts. Include supporting data—a copy of the ad and details about the portions that proved to be untruthful or misleading. Address Mr. Paul Butz, Bureau of Consultation, Federal Trade Commission, Washington 25, D. C. The Commission may take action against the advertiser, to force him to be more truthful in his future advertising claims. However, it cannot get you an adjustment or act as a collection agency.

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often tacked onto the cheapest tires. The Guides state in unmistakable language that "Supers," "Deluxes," and "Supremes" may not be used when they "have the capacity to deceive." If a manufacturer's best tire is called "standard," his third line should no longer be labeled "Super Deluxe High Standard."

Names like "New Tread," "Nu-Tread," and "Snow Tread" have also come under FTC scrutiny. If they apply to used, retreaded casings, ads must "clearly and adequately disclose that same are not new products."

Plies

Designations that might cause confusion about the number of plies will now have to be clarified. If a "Super 6" is actually a four-ply, this fact should be revealed.

There are other ways in which the word "ply" has proved itself a handy deceiver. Some manufacturers count breaker strips —narrow bands of fabric between tread and carcass—as full-fledged plies. The FTC has now officially defined a ply as "a layer of rubberized fabric . . . extending from one bead of the tire to the other." Including anything less than this in the ply count is a form of deception.

"Ply ratings" are in a slightly different class. They do have a recognized meaning for commercial tires and may continue in use. A tire that legitimately has a six- or eight-ply "rating" may be advertised as such, but the description must be "accompanied by conspicuous disclosure of the actual number of plies."

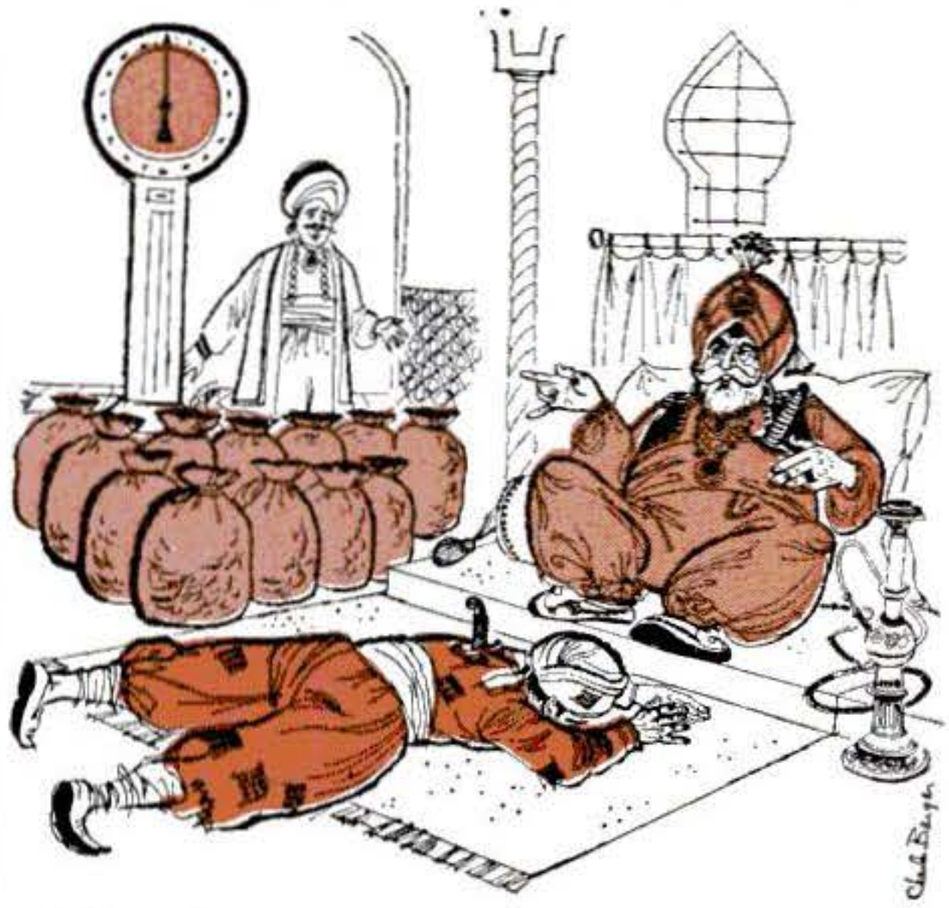
Guarantees

If you've ever tried to get an adjustment on a "fully guaranteed" tire, you may have wondered how such a broad promise could say so little.

It's easy. Tire guarantees vary considerably. In most cases they are "prorated" or scaled down in proportion to the time or mileage you've already gotten. Some guarantees cover original defects only; some protect you against tire failure from a specified list of causes; and some are unconditional, which presumably means that you'll get a proportional adjustment if the tire fails within the guarantee period as a result of any road hazard. A "full" or "lifetime" guarantee may mean any of these things or nothing at all. But henceforth, according to the

[*Continued on page 238*]

Brain Busters



The Case of the Crooked Collector

SULTAN Ibn-al-Kuz watched 12 bags, containing silver coins from the tax collectors of his 12 provinces, being carried in. Although the bags held differing amounts, each of the huge coins would weigh a full pound.

Suddenly a ragged man dashed in and fell to his knees. "Majesty!" he cried. "One of your collectors is a thief. He made me rub each of the coins he sent you with a rough cloth, removing one ounce of silver from it. I crave pardon and a reward. His name is —"

At this moment a thrown dagger silenced the speaker forever.

Each bag bore its collector's name, so weighing the coins would reveal the thief. But the Sultan had only one sufficiently accurate scale, an American penny-in-the-slot machine. And he had only one American cent. Therefore he could weigh any number or assortment of coins, but make only a single weighing. How could this reveal the underweight coins?

ANSWER: Any number of honest coins would weigh as many even pounds, but one bad coin would make the total so many pounds and 15 ounces, two bad ones 14 ounces, and so on. The Sultan put one coin from the first bag, two from the second, three from the third and so on—78 in all—upon the platform. When the penny was inserted, the scale showed 77 pounds, nine ounces—or seven ounces short. An executioner was promptly dispatched to the collector who had sent the seventh bag.

Adapted from Puzzle-Math *(Viking Press). Copyright, 1958, by George Gamow and Marvin Stern*

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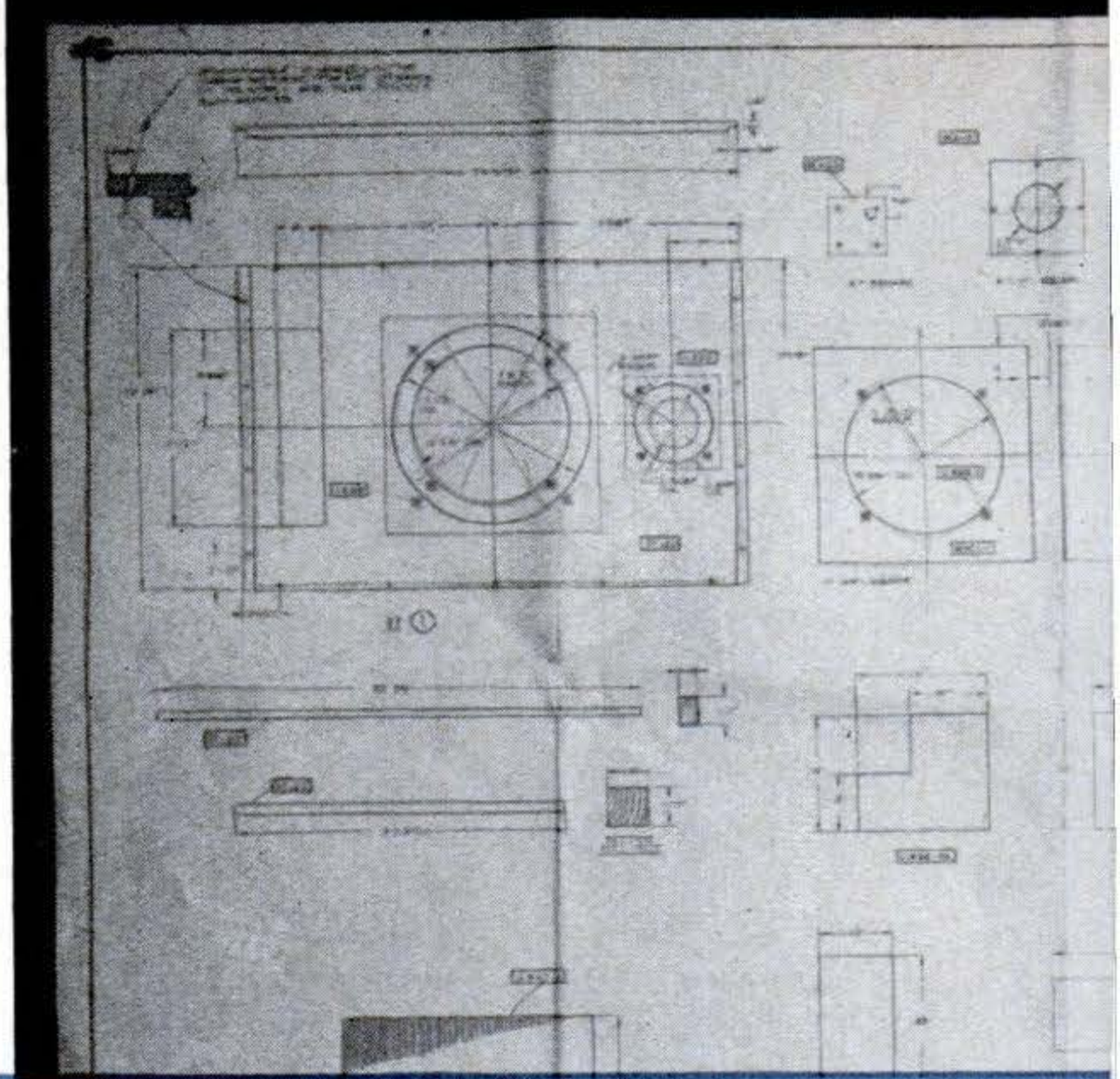
Nobody can read your mind. You may be the smartest man in the company but it won't do you much good if you can't put your ideas across in clear and forceful language that holds your listeners' attention



The Secrets of Talking More Effectively

By Max Gunther

YOUR boss calls you into his office. The production manager and a couple of other executives are there. "Joe," says your boss, "you've been working around that new process more than anybody else. What do you think of it? Reckon it's paying off?"

All eyes are on you. The executives lean forward expectantly.

What's your contribution? Do you mumble an awkward, badly organized reply that leaves your hearers wondering just what you mean? Or do you give them a crisp, clear, useful answer?

When you're gone, does one executive say: "That man has a sound head on his shoulders. What's his name, again?"

Every office and industrial shop has its quota of anonymous men. They're as intelligent and hard-working as anyone else, but no one pays them much attention. When big promotions are handed out, they're forgotten. The reason can often be summed up in a glib-sounding but mean-

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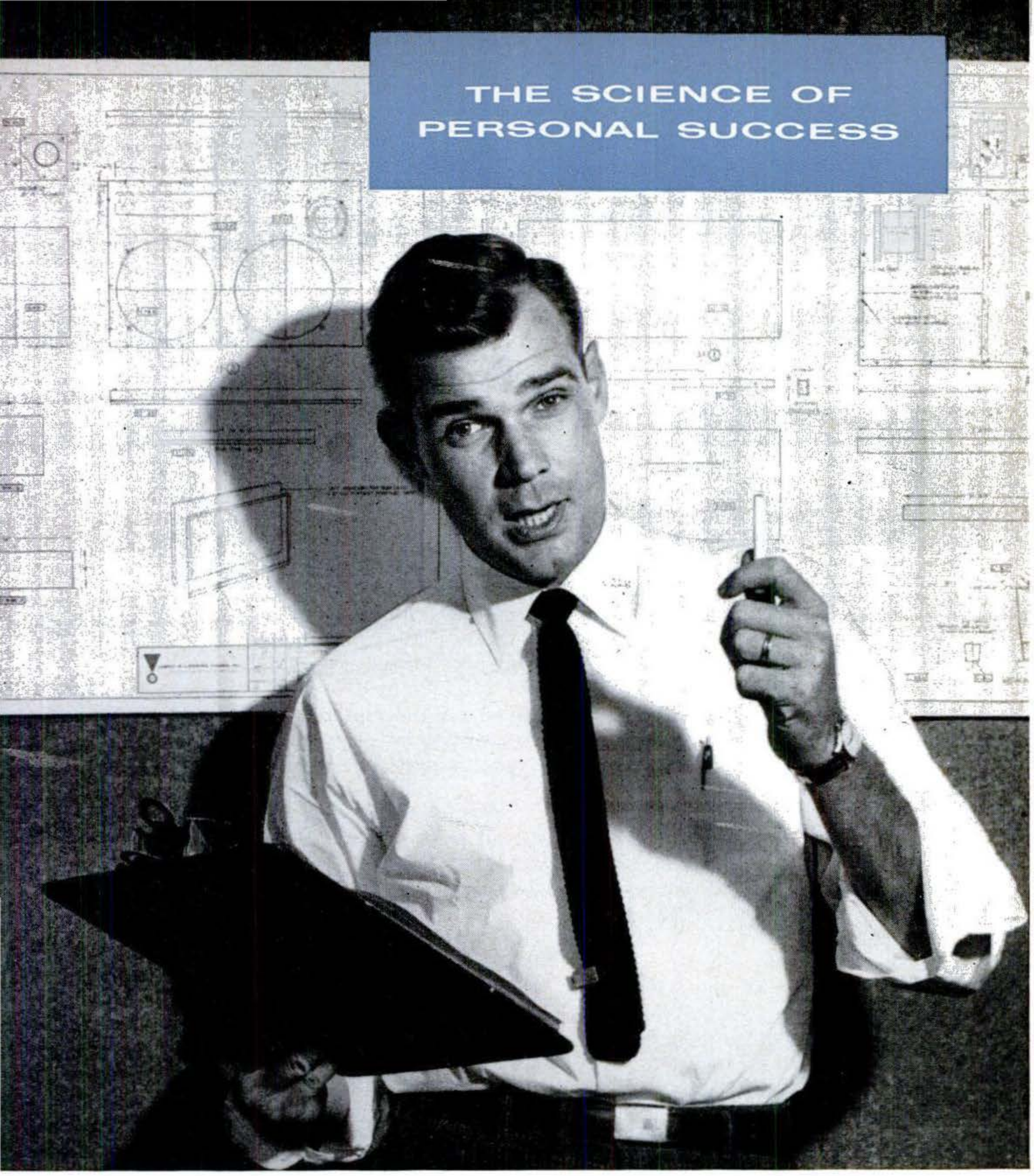
THE SCIENCE OF PERSONAL SUCCESS



ingful phrase: They don't communicate.

Nobody can read what's in your brain. No one is likely to discover that you have a keen mind for problems, or a fund of valuable ideas, until you feed this information out in the form of words—usually spoken words. Talk is your best means of advertising yourself; and advertise yourself you must, or you're in serious danger of being lost in the shuffle.

You'll be talking every day of your career. Sometimes it'll be only to one man: You'll be discussing a problem, asking for a raise. At other times, it'll be to a small group, maybe a committee meeting. Later you may find yourself on a platform, speaking to a bigger audience. This is especially likely if you're in a technical field, because today companies like to send technical people out for public-speaking engagements.

To a great extent, your success in landing the big jobs ahead will hinge on how well you answer this endless demand for

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talk. "People who have learned effective speaking stand out," says Thoburn Stiles, who teaches talk at General Electric. "The gain in poise alone is invaluable."

Thus, if you consider yourself less than a good speaker—if you feel uncomfortable as you talk, if you sense that you aren't getting your meanings across—better spend a little time on improvement. Virtually every adult-education program includes a course on speaking. You may want to sign up for such a course at night.

Or run your own course: Get a few friends together and schedule sessions of practice and mutual criticism. For textbooks, see your local librarian. There are plenty of good books and pamphlets on the subject.

The first thing you'll learn may surprise you: Whether you're talking to one man, five, or 500, the principles of effective speaking are the same. The only real differences are those dictated by common sense—that you need, for example, to talk louder to a big group.

"Every time you open your mouth with a purpose, you're making a speech," says the American Management Association's David C. Phillips, who teaches speaking to company employees sent him from all over the world. "There is really no such thing as a science of public speaking, as opposed to a science of living-room speaking. Both are branches of the same tree."

In Phillips' AMA classes, students' talks are tape-recorded at the beginning of the course and at intervals through to the last day. Listening to some pairs of tapes made as little as two weeks apart, it's hard to believe you're hearing the same man.

The science of talk breaks down into two main parts: what to say, and how to say it—organization and delivery.

What to say

In teaching organization, Phillips uses a formula developed by two former New York University professors, Richard C. Borden and Alvin C. Busse. They hold that there are four common types of unfavorable reaction on the part of listeners: (1) Ho hum. (2) Why bring that up? (3) For example? (4) So what? You can avoid all these potential killers by your choice and organization of subject matter.

Ho hum. Your hearers are bored or anxious to be doing something else.

As your first step in making them want to hear you, says Phillips, "tune in on them." Assess their experience background—what they know, what they've seen—and tailor your words closely to it. Talk in terms of things familiar to your listeners. Don't ever try to snow them with technical or fancy terms from your own background. Far from impressing them with your knowledge, this will bore them stiff—or, worse, irritate them.

Assess their mood, too, and fall in with it as far as possible. For instance, don't try to bring up a serious or unpleasant subject with a group of men about to leave on a weekend fishing trip. If your mood is counter to theirs, they won't listen closely and they won't remember what you've said.

Unless it's unavoidable, says Phillips, never say anything important to a man when he's angry, when he has just made a mistake, or when he's excessively tired. Don't ask your boss for a raise, for instance, at the end of a long, hot, crisis-fraught day. He may no longer be capable of absorbing your arguments, and he isn't likely to care much anyway.

As you start to talk, take great care to tell your hearers why they'll find it valuable to listen. Adopt their point of view. Don't tell your boss: "The stockroom needs reorganizing. I never know where anything is, and some nights I don't get home till nine o'clock . . ." Put it in terms of his problems, not yours: "Things would run a lot smoother for you if the stockroom . . ."

"This 'you' approach is the best attention-getter we know," says A. J. Drucker, talk teacher at International Business Machines. "It's far better than the tired old trick of opening a speech with a funny story."

Why bring that up? Your audience isn't sure where your words are heading. Unlike written language, says James M. O'Neill in his book, *Extemporaneous Speaking,* spoken language must be "instantly intelligible." Your listener can't jump back a paragraph to pick up a lost thread of meaning, or skim forward to see where you're leading. "Never say anything," says William West, an engineer who teaches speaking at General Electric, "without first telling your hearers exactly

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It's all in how you say it . . .

IN HIS book, *Extemporaneous Speaking*, James M. O'Neill stresses that you have other tools besides words themselves to use in making your talk clear and colorful. Here's an exercise adapted from the book:

Take the sentence, "John Smith is an honest man." Say the sentence aloud eight times, not changing a word, but using voice tone and pitch, gestures, facial expressions, and everything else at your command to give it these eight different meanings:

1. John Smith is beyond doubt an honest man.
2. As far as I know, John Smith is an honest man.
3. After hunting high and low, I've finally found an honest man: John Smith.
4. Despite all circumstantial evidence to the contrary, I still contend that John Smith is an honest man.
5. John Smith is not an honest man.
6. Is John Smith an honest man?
7. John Smith is an honest man, but his brother isn't.
8. John Smith, while an honest man, has other shortcomings.

why you're saying it." Otherwise, they'll be so busy figuring out how the words contribute to the purpose that they won't absorb the words themselves.

For example, suppose you phone a department-store adjuster with a complaint about an electric saw you bought. You introduce yourself and start in: "Couple of weeks ago I ordered an electric saw from you people. The salesman told me he was sold out of the model I wanted, so . . ." By the time you're halfway through your complex story, the adjuster is lost. To keep him with you, start with a short introduction to focus your speech, giving a reason for the words that will follow: "I just got a bill from your store for an electric saw I'd ordered. The bill is $10 too high. Let me explain how it happened: Couple of weeks ago . . ."

"Never merely talk *about* something," urges Phillips. "Always talk to a point." Suppose a men's group in your company or town asks you to speak about antique cars, your hobby. Don't make your speech "All I Know About Antique Cars." Instead, give it a sharp focus, perhaps "Were the Old Flivvers Better Built?" That way, it'll be much easier for you to keep your listeners aware of where your words are heading.

For example? Your audience isn't satisfied with generalities. Don't say: "There's a lot of grumbling about the company vacation policy." Be specific. Tell how many people are grumbling, and exactly what aspects of the policy are unpopular, and precisely why. "Unless you support a statement with examples," says

[Continued on page 246]

Hints on stage fright

- Welcome a little nervousness. Experts say it's nature's way of supercharging you for extra effort. Even veteran speakers are keyed up beforehand.
- Look your listeners straight in the eye. If the audience is big, let your eyes rove around the faces. This will boost your self-confidence. Avoiding your hearers' gaze leaves you frightened.
- Use visual aids: a blackboard to scribble on, charts and diagrams, models, pictures. This dissolves the problem of what to do with your hands as you talk.
- Make no attempt to memorize what you're going to say. Informality adds vividness to your talk.
- In a formal speech, let a moment of silence go by after you've stood up and before you start talking. Take a deep breath, look around at your audience, and collect your thoughts.
- Pause often. Don't feel you must fill every second with talk.
- Talk unhurriedly, so that you have time to take good, solid breaths. Otherwise, you risk "voice failure"—a condition in which your voice becomes breathless, shaky and weak.

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Pontiac Goes Classy

Yesteryear's older, gawky brother of Chevrolet moves up in the world and makes a bid for the automotive social register

Hardtops crouch as low as 54.6 inches. Car lengths range from 213.7 to 220.7 inches.

A HALF-DOZEN years ago the people who designed the Pontiac automobile decided to wipe its nose and put it in long pants. In the 1956 models they scrubbed its face. In 1957 and 1958, when they attired it in store clothes, the Pontiac began taking on a mature, if brash, appearance.

Now the 1959 Pontiacs are here, and the transformation is complete. Champions of the car will say that it's the most beautiful of the entire new U. S. crop, and it may well be.

In the department of vital statistics, the vehicle (once again!) is lower. And (you will just have to accept this on faith) it's up to nine inches longer and more than three inches wider.

It wasn't ballooning the size, of course, that took the Pontiac out of homespun knee britches. It was the styling, which is surprisingly restrained and artfully simple. It was also the engineering of the machinery, which is sophisticated and second to few in power and performance.

In looks and behavior, the Pontiac, in a manner of speaking, has moved into a better neighborhood. It's no longer merely an older, gawky brother of the Chevrolet. At long last, it has its foot in the door of the automotive social register.

Mechanically, the most obvious change in the car is in tread width, the lateral distance between the wheels. The front tread is just shy of five feet—five inches wider than in 1958. The rear tread is 64 inches, more than 4½ inches wider.

Cause and effect: This is the natural result of the adoption by the parent corporation, General Motors, of interchangeable body parts [PS, Oct.]. With Pontiac sharing parts with two of the Buick series of cars, two of the Oldsmobiles, all the Chevrolets and one series of the Cadillac, it was inevitable that the overall width of the 1959 Pontiac would go up. In 1958 the width was 77.4 inches. It's now 80.7 inches, which figures out roughly at 6⅔ feet—or within a long foot of the legal limit for trucks in many states.

There is a maximum variation of exactly nine-tenths of an inch among the widths of all five GM cars for '59.

Stretching the Pontiac treads was based —let's be fair—on sound engineering principles. A car's "roll rate," the readiness of the body to lean on a hard turn, varies as the square of the tread. So a wider tread means more "roll stiffness." Centrifugal force transfers less weight from the inside to the outside wheels in a sharp, fast turn. For a given car height, a wider tread also automatically produces a lower center of gravity, which means more stability.

Additional happy results are attributed by the Pontiac engineering staff to widening the tread—less steering-wheel fight in a crosswind and an opportunity to soften the springs without degrading the car's cat-footedness.

"And then, too," said one engineer wryly, conscious of some shameful U. S.

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driving habits, "you've got more chance of keeping two wheels on the road in a turn."

What he didn't explain was how to get those same two wheels through home garage doors that were built for Model A Fords.

Engines are newish. Bearings are bigger. Last year Pontiac offered an even half-dozen engine options ranging in power from 240 to 310 horses. For 1959 the options number eight, ranging—and mark the *decrease*—from 215 up to 345 horses.

The basic engine is the same on all these options. It's a 389-inch job, up 19 inches in cubage since 1958 by virtue of leaving the bore at 4.06 inches and lengthening the stroke from 3.56 to 3.75 inches. The horsepower choices are produced quite simply—by juggling compression ratios and carburetion. Compressions run from 8.6:1 to 10.5:1, and carburetors from a two-barrel through a four-barrel to three two-barrels.

Regular fuel will burn nicely in an 8.6. At 10 and up you'd better say premium please to the pump jockey.

Pontiac has invested some of its added cubage in torque, that push at the rear wheels for takeoff, and for passing in the middle-speed ranges. The 215-horse engine has 36 more foot-pounds of torque —a total of 390—than the 240-horse engine had in 1958. The 345-horse engine has 25 more foot-pounds—a total of 425 —than last year's 310-horse job.

The company has introduced a switch on the dying horsepower race that is common this year to many cars: A motorist can have his horsepower cake and eat it, too. When the conversation on the front lawn of a hot Sunday afternoon turns to automobiles, a man will be able to boast as proudly as ever about his car's horsepower.

But now all that horsepower needn't cost him any more in fuel. The synchromesh axle ratio is down from 3.42:1 in 1958 to 3.23, and that for the Hydra-Matic transmission from 3.23 to 3.08. For the penny-watcher, an axle ratio as low as 2.87 is available.

The lower the ratio, the fewer the revolutions of the engine per mile; and the fewer the revolutions, the less the gas consumption. But don't forget: Performance drops, too.

Fuel injection is no more in the Pontiac. Too expensive, too unpopular, too hard to service.

Pontiac, with Oldsmobile and Cadillac, benefits from still further research on Hydra-Matic. Transitions from one gear to another are unbelievably smooth in the new models.

A bigger car naturally means more leg- and hip-room for the driver and his passengers. And even with a lower roof, there's a mite more head room in the front seat and only an inconsequential reduction in the rear in the 1959 Pontiac. Here's a comparison in inches on one model, and it's given here because it typi-

HOODED INSTRUMENT CLUSTER contains new blinker lights for temperature and oil pressure. The glove-compartment door (not visible) becomes a handy snack bar when lowered.

FUEL FILLER DOOR is centered, immediately below deck lid. Bigger brakes, moved slightly inboard, have bigger effective lining area and, in front, a heat-dissipating flange on drums.

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TRUNKS measure 55 inches wide, five-feet-and-up in length, depending on the series, and 19.5 inches high, an increase of two inches. Usable luggage space runs up to 24 cubic feet.

fies what's happening to most Detroit cars this season:

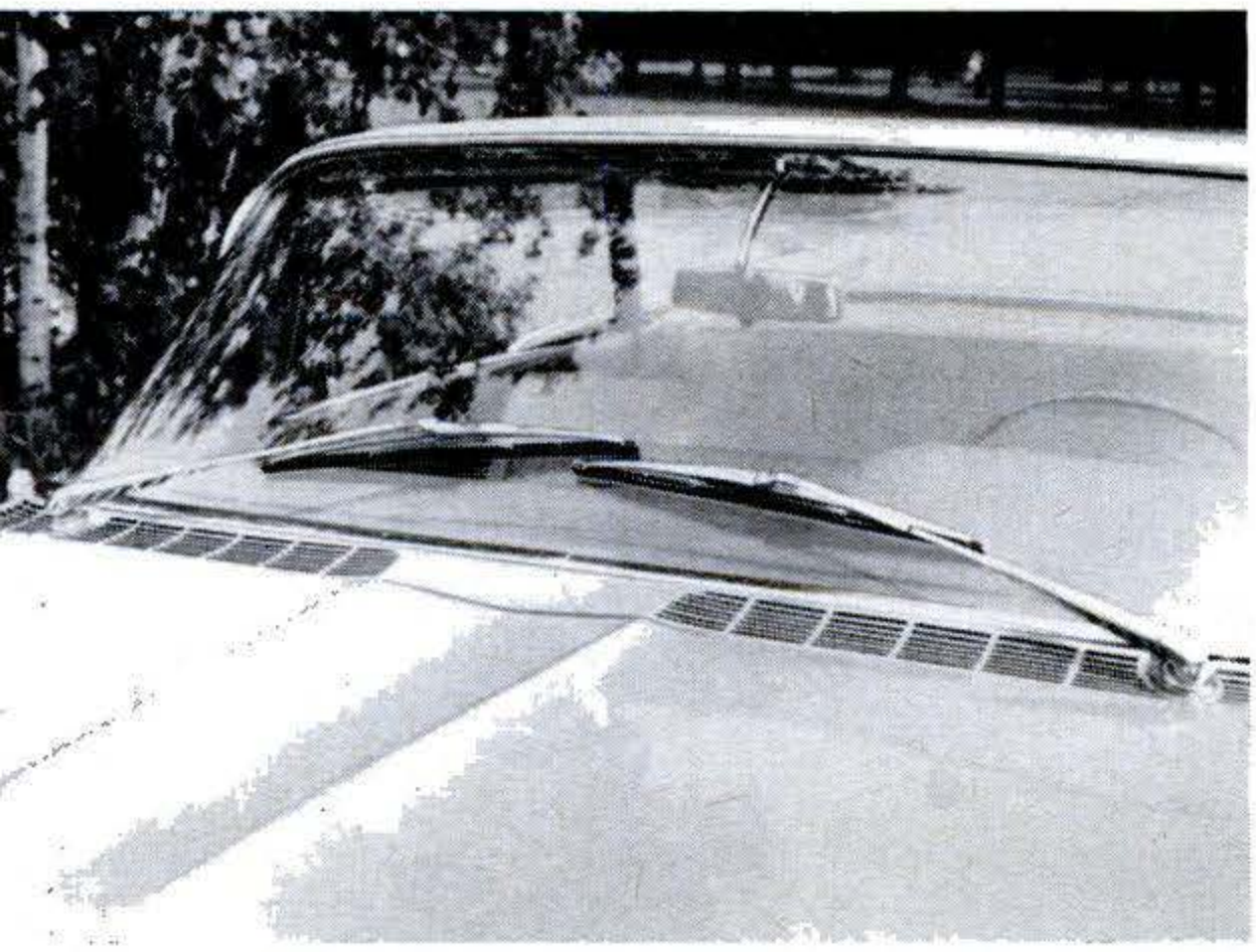
	1958	1959
Front leg room	44.5	44.8
Rear leg room	41.4	42.5
Front head room	35	35.6
Rear head room	34.3	34.2
Front hip room	62	66.3
Rear hip room	63.1	65.4

But despite thin roofs, now on all the GM cars, the low silhouettes have been achieved only at a cost. The 1958 Pontiac front seat was only marginally comfortable at 10.2 inches off the floor. The 1959 height is down to 9.9 inches, and the back seat is down from last year's 12.8 inches to 9.7.

Moreover, something else had to give in the process of creating head room—the road clearance. For 1959 it's chopped a half-inch to a bare 5.7 inches. That means the side rails will clear crab apples and garter snakes with plenty to spare.

Fewer options. In a time when auto manufacturers consider it a breach of good manners not to announce a galaxy of expensive appurtenances with each model change, it's pleasant to report that one company has junked some options. The new Pontiac not only is without the catnip of fuel injection. It's also without last year's "memory seat"—the eerie thing that moved the seat back and forth at a turn of the ignition key—and a door-lock warning light. The outside spare-tire carrier is gone, too.

In token of Pontiac's new status in the social swim, it has gone to court for some name changes. The Chieftain and Super Chief were too gauche. They are excised, kaput. Remaining as series designations are the classy-sounding Star Chief, Catalina and Bonneville.—*Devon Francis.*



NO UNSWEPT GLASS here in the middle: Wipers overlap 2½ inches. They're electric, and operate in parallel. The windshield, curving backward into the roof, is 26.5 inches high.

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How Your

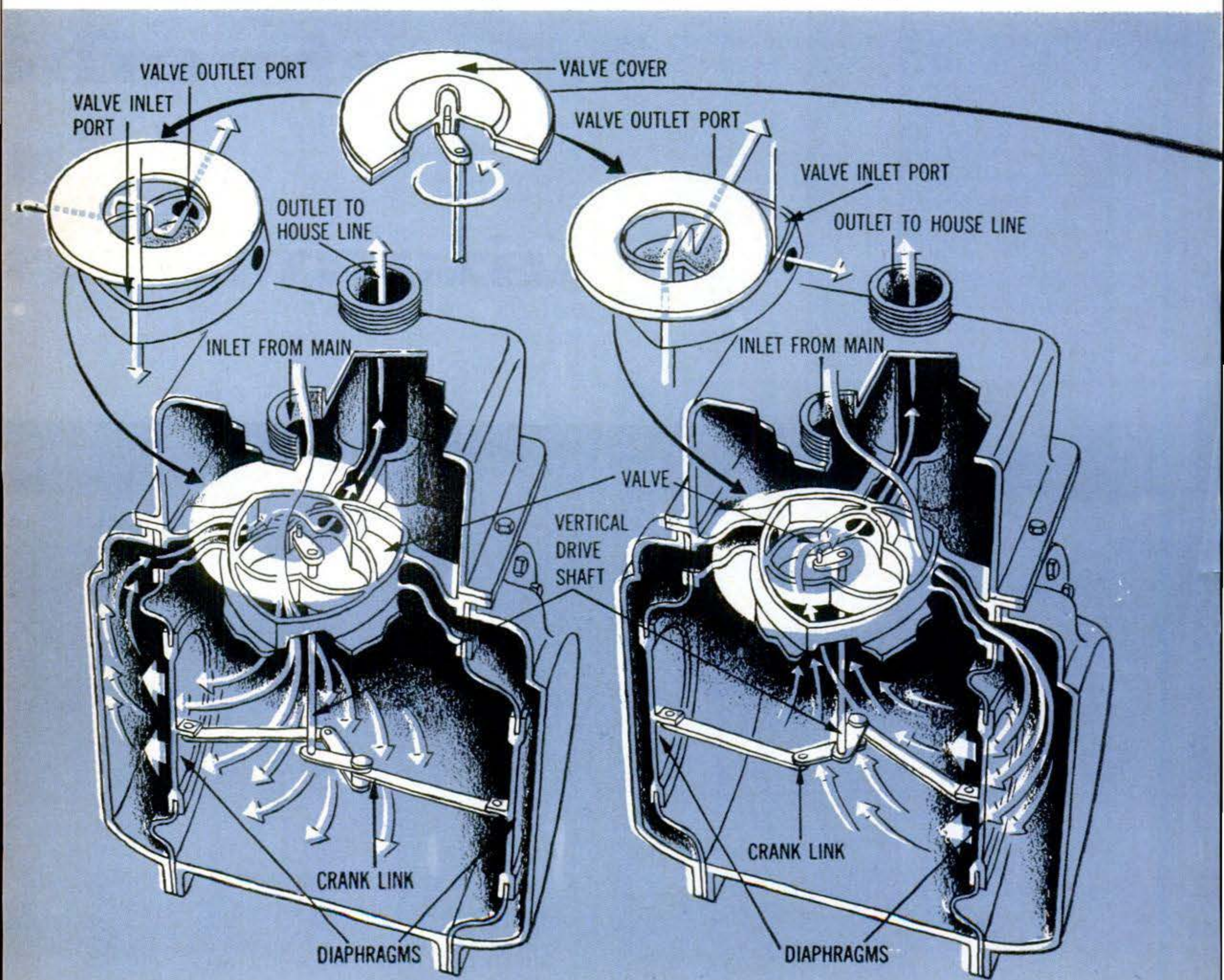
Bellows and sliding valves

By Herbert O. Johansen

THE device that meters your gas consumption is a "breathing" machine. It inhales from the street main and exhales into your house line in measured gulps that add up to a monthly billing of cubic feet of something you can't see or weigh, but do pay for.

The positive-displacement dry meter was invented more than 100 years ago. The one you have works in the same way, but it is smaller, more rugged, more accurate. Before it was invented a householder on the gas line was charged by the number of gas burners or lights he had. To make sure that night owls didn't go over their quota, a gasman came along in the late evening, tapping a stick on the sidewalk—a signal that it was time to turn off the gas.

Before gas could become big business, a "cash register" was needed at the point of sale or use. In the early days wet meters were used briefly but they proved to be unsatisfactory. The story goes, however, that they were popular with the men



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Gas Meter Works

direct the flow and spin the dials that indicate how much you use

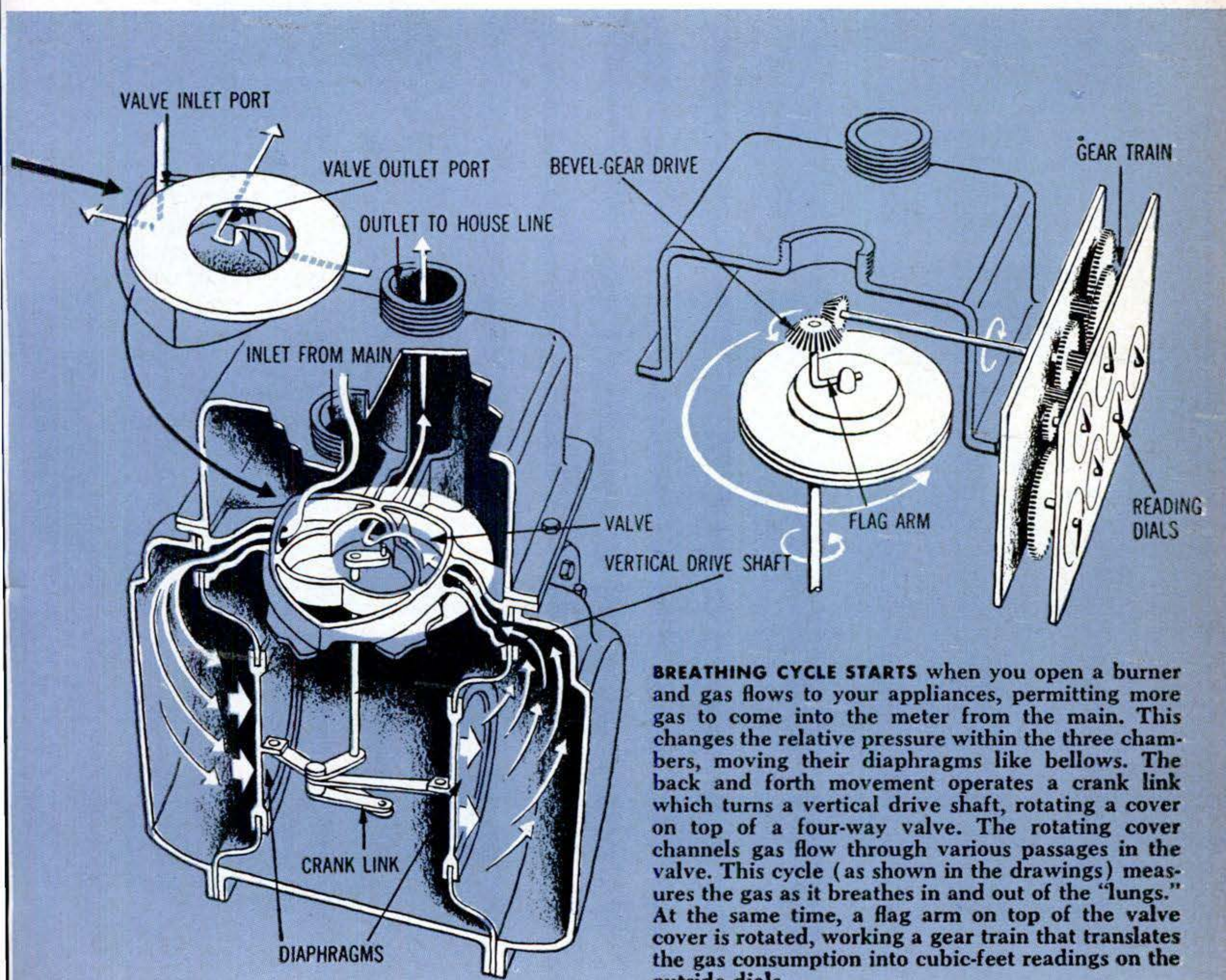
whose job it was to replace the water in the meters with whisky as freezing weather approached.

A practical dry meter made its appearance in 1844 and it came to stay. Last year 30,000,000 of them throughout the country measured seven trillion cubic feet of home-consumer gas (more than 90 percent of it natural gas) to ring up a total sales of about four billion dollars.

The meter used as an example on these pages is a three-chamber meter made by the Sprague Meter Co., of Bridgeport, Conn. Yours may be of another make, look different, have four chambers, or a different valve arrangement, but the principle of operation is the same.

The meter is subjected to a standard house-line pressure at all times, whether any gas is being used or not. When you turn the gas on you start the meter working by lowering the pressure in the chamber that is in the exhaling position. Since pressure in the next, or adjoining, chamber remains constant, the diaphragm between them will move toward the low-pressure side. Meanwhile, as this diaphragm is approaching the "empty" position, the other diaphragm is in its filling (inhaling) cycle.

This motion of the diaphragms, acting like pistons in a reciprocating engine, is transferred by a crank link (connecting rod) to a central vertical shaft that turns



BREATHING CYCLE STARTS when you open a burner and gas flows to your appliances, permitting more gas to come into the meter from the main. This changes the relative pressure within the three chambers, moving their diaphragms like bellows. The back and forth movement operates a crank link which turns a vertical drive shaft, rotating a cover on top of a four-way valve. The rotating cover channels gas flow through various passages in the valve. This cycle (as shown in the drawings) measures the gas as it breathes in and out of the "lungs." At the same time, a flag arm on top of the valve cover is rotated, working a gear train that translates the gas consumption into cubic-feet readings on the outside dials.

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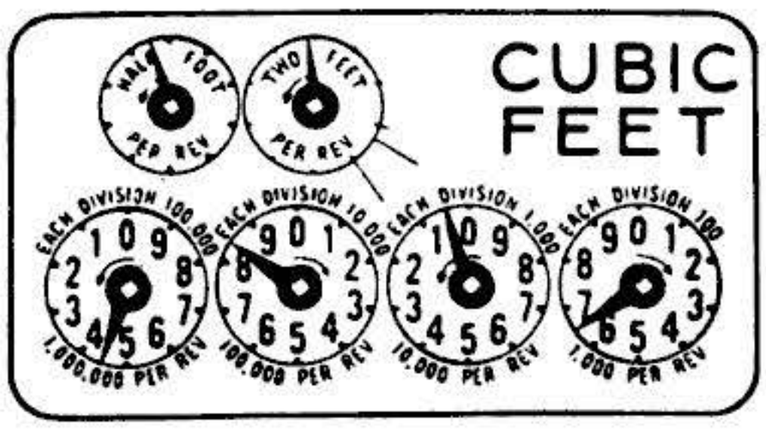
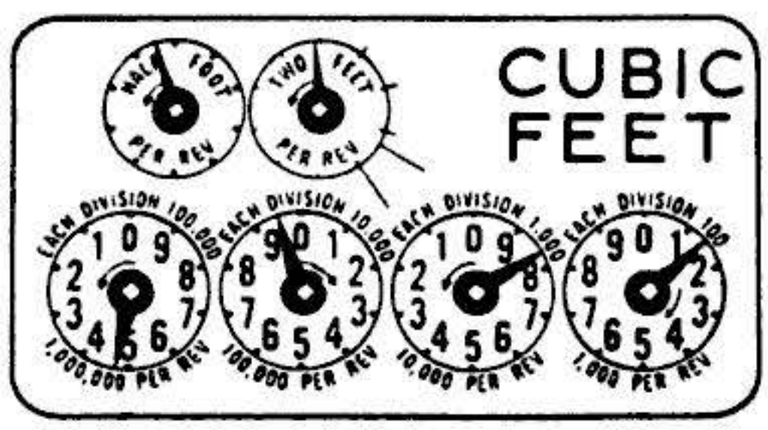
How to read your gas meter



NOTE DOWN THE LOWER of the two numbers between which each of the dial hands point. Above is a "previous" reading of 4-8-0-6. Below is a "current" reading of 4-9-8-1. The difference between the two readings—175—with two zeros added—is the amount of gas you have used between readings: 17,500 cubic feet.



a valve cover at the top of the meter. Moving counterclockwise in a planetary path around the center of an intake-outlet valve, it times the filling-exhaust cycles of the chambers, somewhat as a distributor controls the firing cycle of an automobile engine.

As the valve cover turns, it also operates, through a flag arm, or stud, the gear train that measures the gas you are using and translates it into dial readings of cubic feet.

Gas meters have to be accurate, not only to protect the customer and the utility company, but because of state laws. In New York, for example, meters are required to be accurate within two percent, and must be replaced or removed for testing every seven years. Should they be in error, however, the American Gas Association says that the erring is likely to be 14 to one on the "slow" side, in your favor when the bill arrives.

Sensitivity, the ability to detect even the faintest "breathing" of the "lungs," is a gas-meter must—especially where pilot lights are concerned. A single pilot light may use as little as one-quarter cubic foot of gas an hour, or 1/700 the capacity of the average home meter. But since pilot lights are on all the time, they may account for as much as one-quarter of the monthly gas bill.

When you turn on the oven light for a big six-hour Thanksgiving turkey, you will have used up 120 cubic feet of gas before it is golden-brown tender. In the Northeastern states this will add about 18 cents to your meter reading, but less than 10 cents in gas-rich areas such as Oklahoma. On the other hand, boil a three-minute breakfast egg on a top burner and your meter will click up only about half a cubic foot.

Coming up is a meter that will convert these cubic feet of gas consumption into direct index readings of dollars and cents. When the happy day arrives, the householder will be able to glance at his meter any time of day or night and read exactly how much he owes.

Meters vary in capacity. If you have only a cooking range and a gas water heater, the chances are that your meter is of the 175-cubic-feet-an-hour size. Add a gas-heating plant, and you'd probably get one that can handle 240 cubic feet an hour. For large apartment houses, hotels and factories there are meters that cycle 1,000 cubic feet of gas an hour.

Recently the American Meter Co., of Philadelphia, came out with a new small, 60-cubic-feet-an-hour capacity meter—half the size of standard home meters. It is of the familiar "box" type, but of welded construction so that it cannot be opened. With clean natural gas taking over, it is not expected that there will be any need to take these meters apart. Adjustments can be made from the outside to keep them in perfect operating condition for perhaps 30 years or more.

Gas meters, on the whole, are well behaved. Sometimes, however, they do develop squeaks, squawks or whines. In an electric meter that wouldn't matter, but in a gas meter the pipes act as sounding boards throughout a house—making for eerie and alarming effects when the harmonics happen to be right (or wrong).

"There's-a-burglar-in-the-house," calls have frequently sent local police scurrying to "nab" a culprit that turned out to be merely a gurgle in the gas line. And there is at least one instance of a wall being ripped out to rescue a trapped kitten that was only a miaow from the gas meter. END

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Rambler Brings Out Smallest U.S. Wagon

And the big Ambassador gets a new axle ratio to wring more mileage from its 270-hp. engine

THE smallest U. S. mass-production automobile, the zippy Rambler American, appeared in revived dress when its 1959 editions were announced last month —it was a station wagon *and* a sedan.

American Motors had not made a wagon on a 100-inch wheelbase since 1955.

The new wagon has 52 cubic feet of cargo capacity with the rear seat folded down. There's a rear-wheel sheet-metal cutout like the sedan's.

On the company's big car, the Ambassador, the axle ratio is reduced from 4.1:1 to 3.54:1 so its 270-horsepower engine will go farther on a gallon of gas.

Ambassador boasts a new grille and side ornamentation, light-reflective panels in fins.

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INSIDE MONSTER ATOM-SMASHER at Livermore, Cal., mighty stream of hydrogen particles hurtled through these doughnut-shaped drift tubes of up to 10-foot diameter. Looking toward front end, photo shows sheet-copper tube, or "liner," of more than 50-foot diameter, crinkled by water-cooling pipes soldered to its exterior. Through it pulsed thousands of kilowatts of power.

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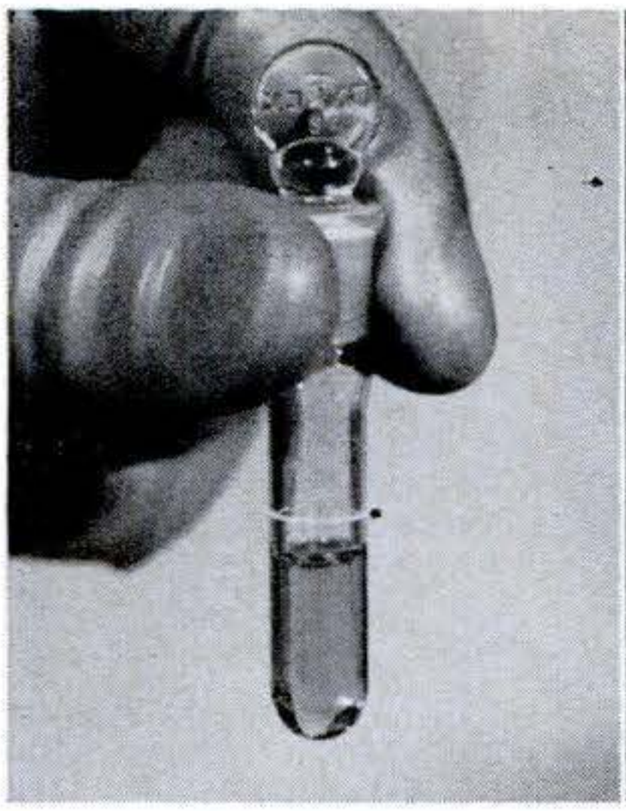

Plutonium . . . the silvery stuff that A-bombs are made of . . . an explosive 18 million times as powerful as TNT . . . more valuable by far than gold . . . strangely warm to the touch . . . not mined but created by alchemy . . . This was the precious atomic-age metal whose lure inspired a bold plan to make it in a giant electric gun—and led to the amazing story told here. Photos above (from AEC's Argonne and Los Alamos Laboratories) show, left to right: plutonium solution that yields the metal; "button" of plutonium metal; and metallic plutonium rod.

U.S. bares story of

The Most Fantastic Atom-Smasher

By Alden P. Armagnac

ONE of the biggest and best-kept of U.S. atomic secrets can now be told. Kept under wraps for years, it is the story of an atom-smasher big enough to swallow a house—and of the part that it played in a famous scientist's startling plan to make plutonium for A-bombs with a gigantic electric gun.

Called the Materials Testing Accelerator to hide its purpose, the monster atom-smasher was operated for nearly two years in a building as big as an airship hangar at Livermore, Cal., and was then dismantled. Reports of what its operators had been up to were stamped with a big "SECRET" and locked up in Atomic Energy Commission files.

Lately the AEC has pulled out some of them, crossed out the "SECRET," and restamped them "Declassified." So quietly has it done so that this reporter discovered it only by coming upon headline-making revelations from the "MTA reports" buried deep among thousands of routinely published, fine-print abstracts of available AEC documents.

From the Library of Congress, this magazine has obtained photostatic copies of the long-secret reports. Queried on points left unexplained, the AEC has now kindly provided POPULAR SCIENCE with authoritative answers; and, from its archives, has furnished photographs and drawings. Thus assembled, here is the story, told for what is believed to be the first time in public print:

Housed in the world's biggest vacuum vessel—a steel tank 60 feet in diameter and 87 feet long—the $13,000,000 Materials Testing Accelerator was secretly

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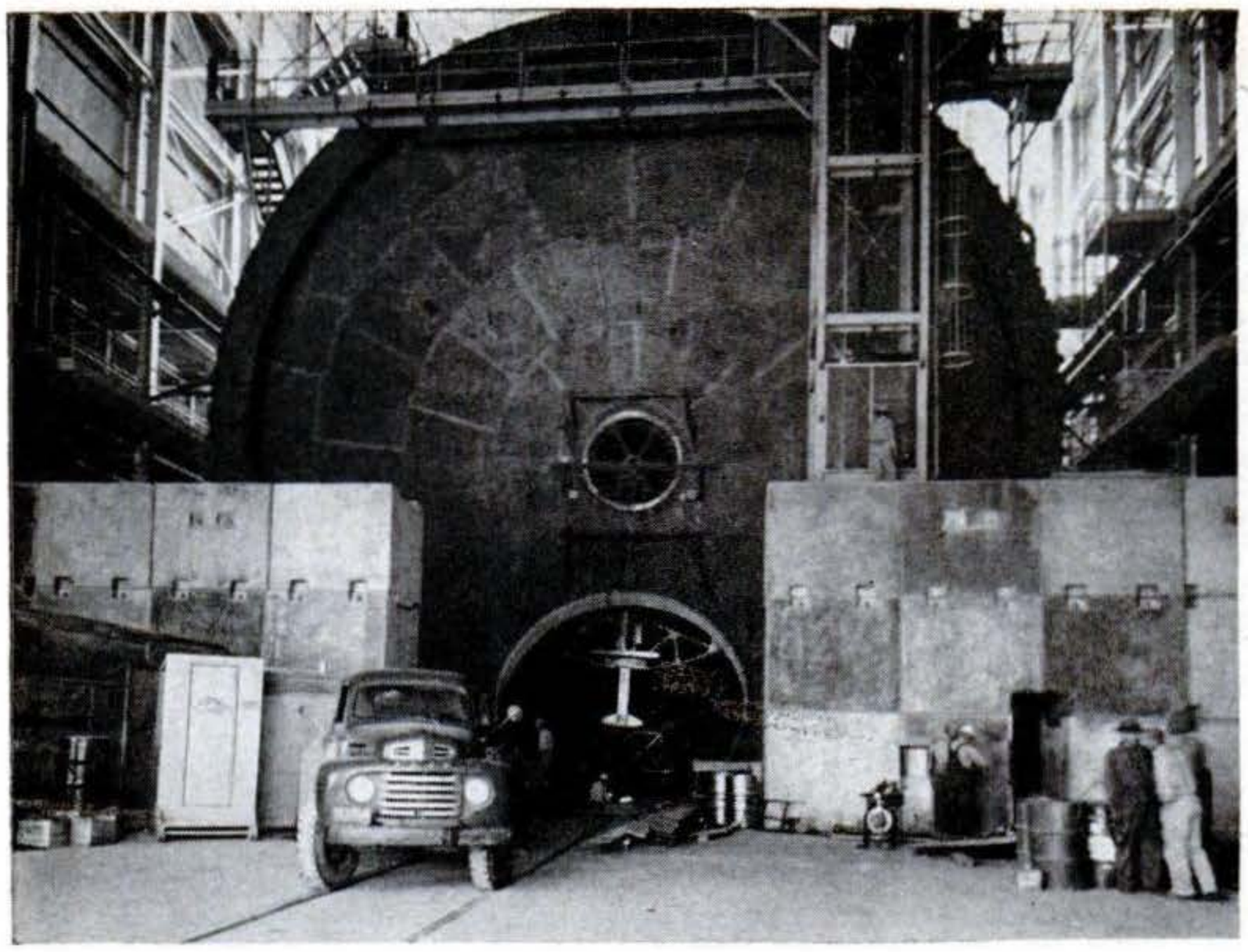
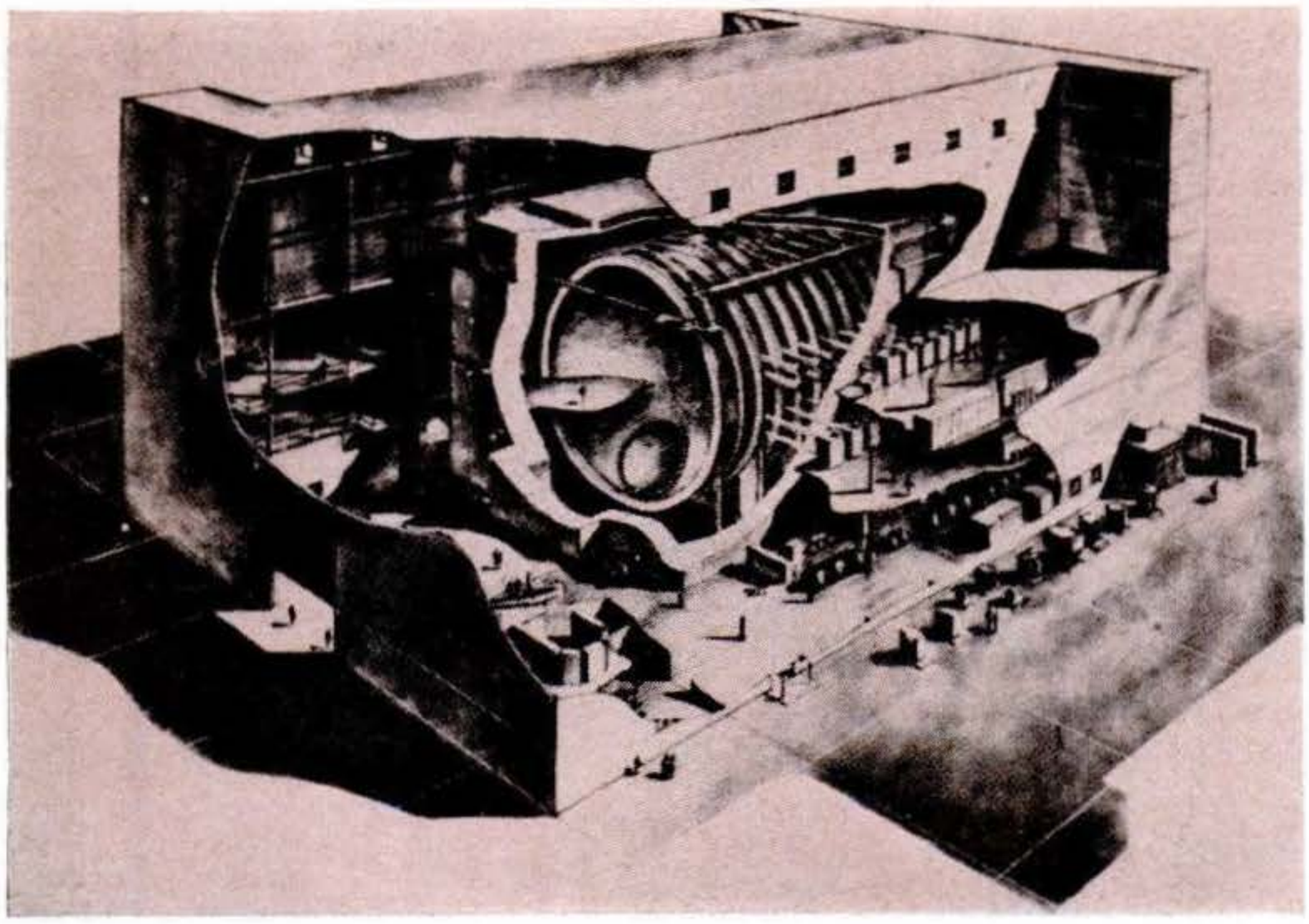


BIGGEST VACUUM VESSEL ever built, 60 feet in diameter and 87 feet long, housed Materials Testing Accelerator. Men and truck in photo show comparative size. Door 20 feet in diameter, opened at tank's bottom, admitted rail car handling drift tubes. Concrete blocks like those seen formed unbroken wall of shielding while the accelerator was running.

completed at Livermore in January, 1952. It was an atom-smasher of the electric-gun type, called a linear accelerator, or "linac" for short—a vacuum tube straight as a rifle barrel, down which atomic particles are fired like bullets at a target. But no such linac as this was ever built before or since.

The fantastic diameter of its 60-foot-long copper tube or "liner," which could be fed with 9,000 kilowatts of radio-frequency power, exceeded 50 feet. (That compared with the 38-inch diameter of the great 40-foot-long University of California linac at Berkeley.) Shaped like a section cut transversely from a 20-sided pyramid, this water-cooled atomic gun barrel tapered from a maximum diameter of 59 feet at the front or injector end to 53 feet at the other.

Shot into it from an electric-arc device, hydrogen ions hurtled along the axis through doughnut-shaped "drift tubes" weighing up to 30 tons apiece. As in all linacs, they shielded the flying particles from the big tube's pulsing electric force, except during the half of its cycle when it would give them a forward boost. These copper drift tubes also contained powerful magnetic coils, to focus the beam of



CUTAWAY VIEW shows Materials Testing Accelerator installed in its hangar-like building. It was remotely operated from ground-floor control room in corner of building nearest in picture. Concrete wall surrounding vacuum vessel that held accelerator was shielding for protection from its powerful radiation.

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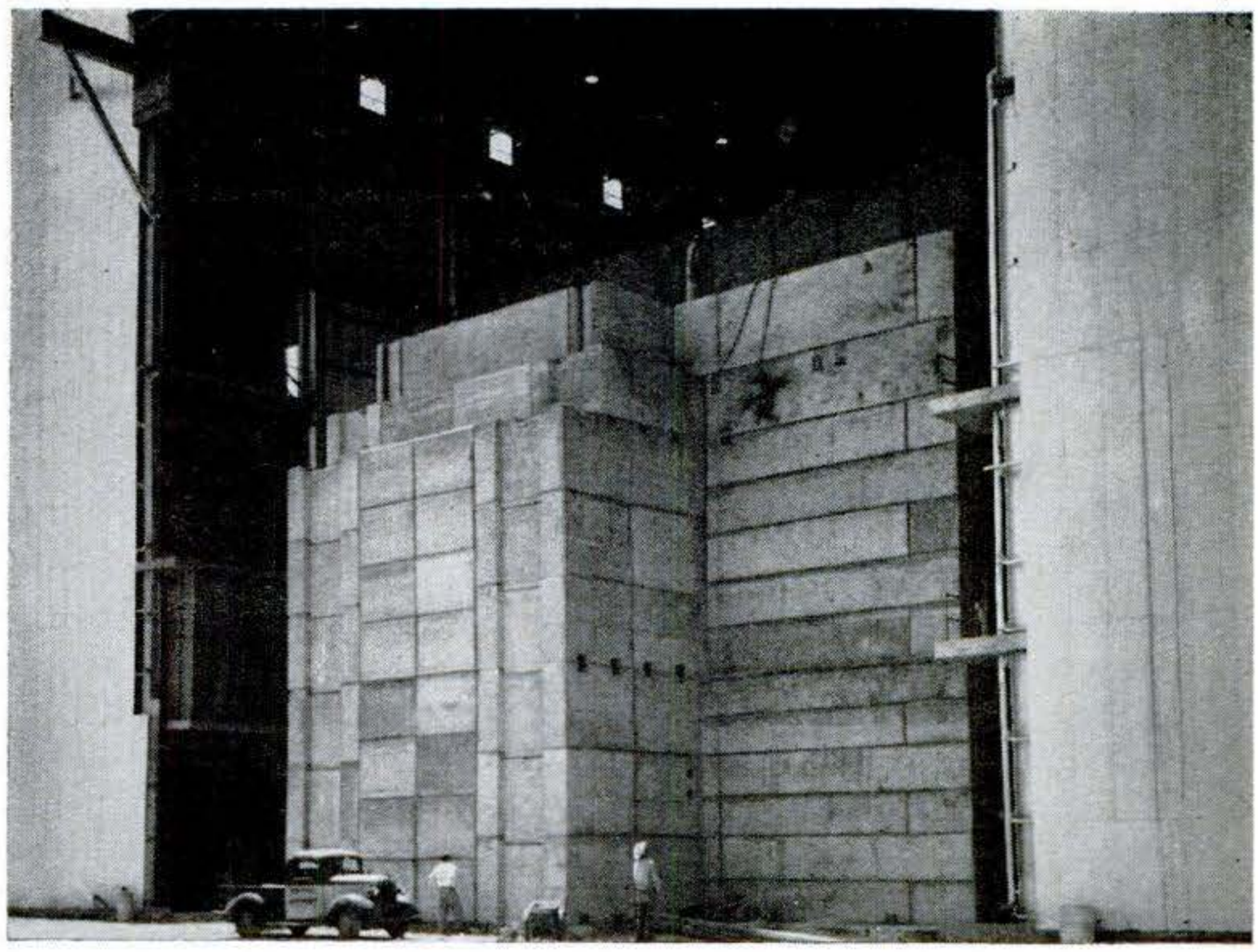


TARGET END of Materials Testing Accelerator called for heaviest protective shielding of all. A crane stacked these concrete blocks to form a wall nine feet thick around the target chamber, where impact of mighty beam loosed shower of neutrons and other dangerous kinds of radiation. Target measured history-making beam current of almost a quarter ampere.

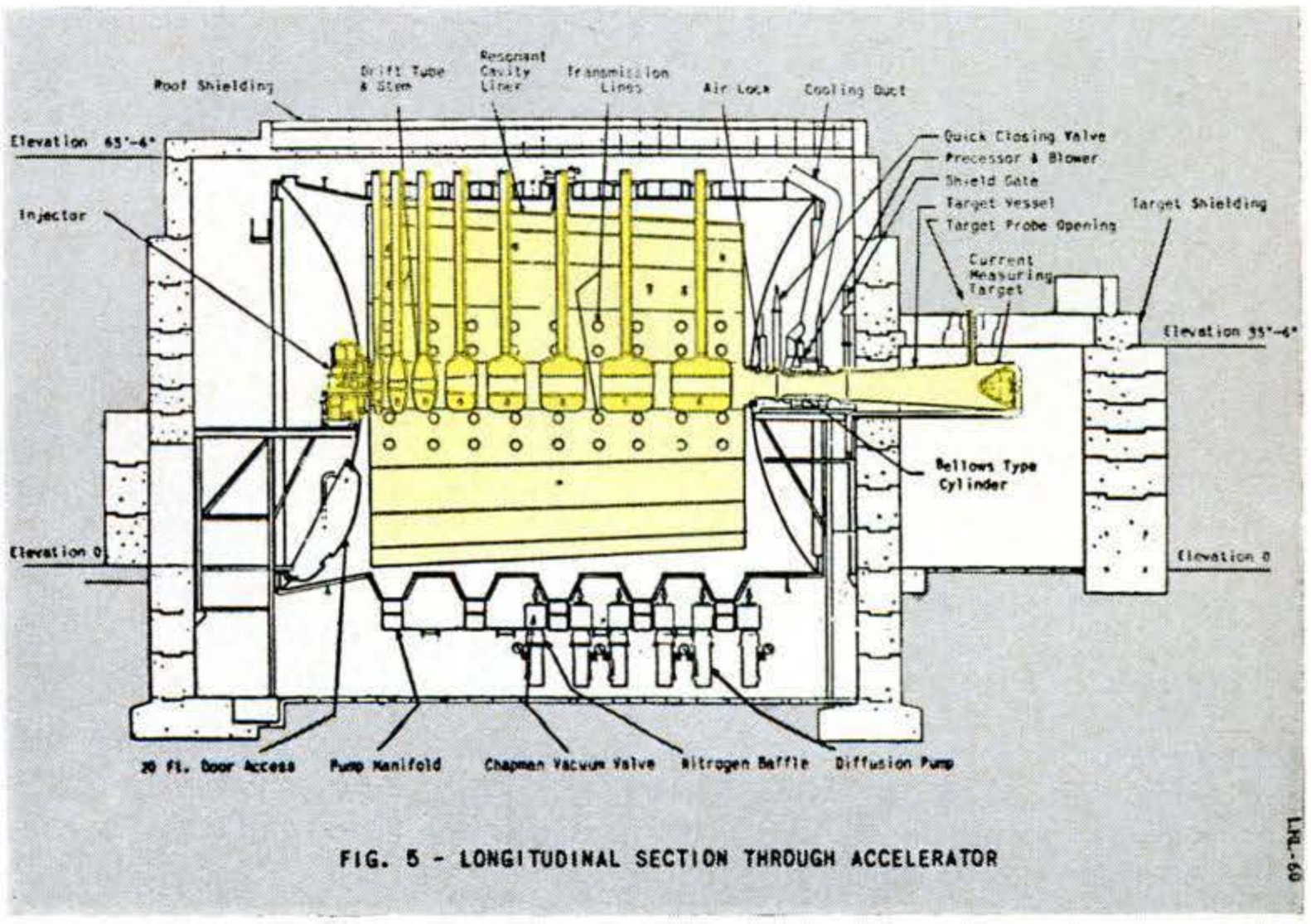
particles, instead of customary focusing grids. The high-current beam of the Livermore machine would melt any grid in its path.

To handle the huge drift tubes, a rail car ran on standard-gauge track within the accelerator, all the way along its bottom. The rails were of manganese-hardened copper. Steel rails could not be used, because of their magnetic properties. The mighty radio-frequency field would heat them to incandescence.

Behind the unprecedented dimensions of the Materials Testing Accelerator lay the aim of achieving an unheard-of "fire-power" with atomic bullets. A conventional linac's beam current, the measure of the rate at which it can bombard a target with atomic particles, reaches peaks of a few millionths of an ampere. The goal of Livermore's giant machine was a fabulous quarter of an ampere.

No toy for academic browsing behind ivy-covered walls, this atom-smashing brute meant business—military business.

Its mission was to develop a revolutionary way to make plutonium for atomic bombs. In contrast with the standard procedure of bombarding uranium with neutrons in great chain-reacting piles like



DESIGN of fantastic Materials Testing Accelerator is shown in AEC diagram, reproduced just as it appeared in secret report—with addition of light tint to distinguish accelerator and its target chamber; and color to emphasize injector, drift tubes, and target. Accelerator is seen enclosed in its great vacuum vessel.

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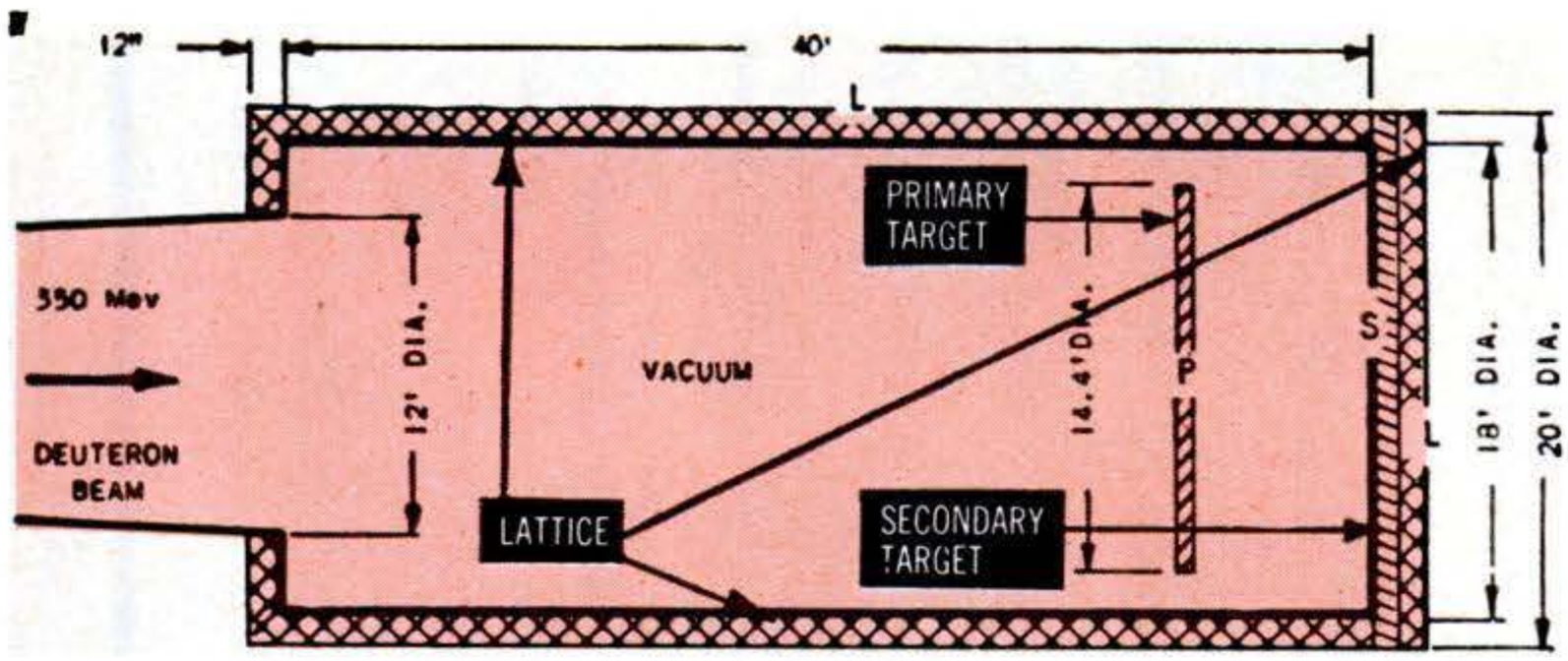
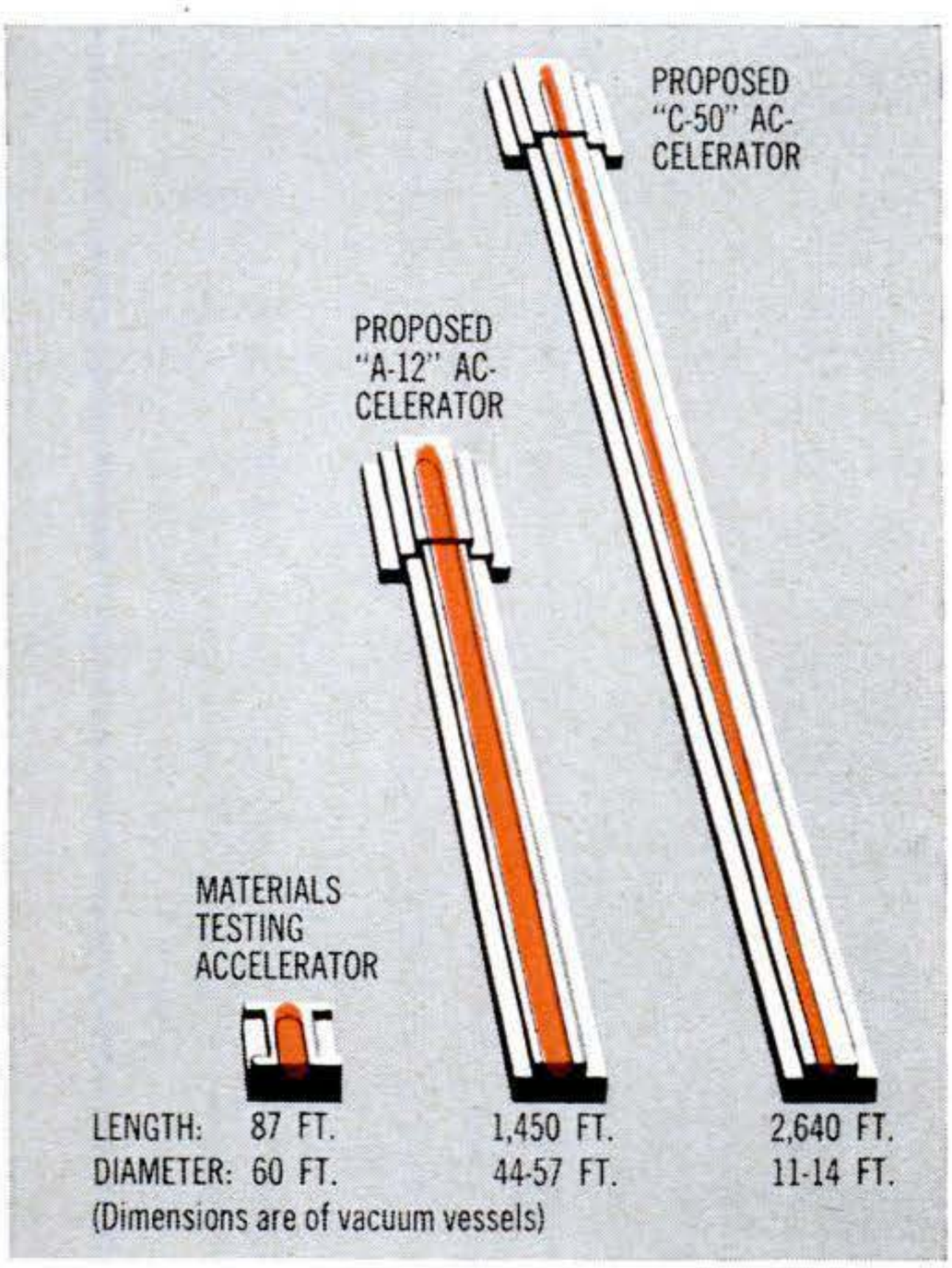


PLUTONIUM-MAKING chamber of "A-12" plant was to have three targets arranged as shown —primary and secondary ones of uranium plates, plus a lattice of inch-thick uranium rods.

those of Hanford, a secret new plan would dispense with piles and a chain reaction entirely.

In the proposed new "electronuclear" method, a gigantic linear accelerator would turn uranium into plutonium. To do this, its high-current beam of deuterons or heavy-hydrogen particles would be converted into a shower of neutrons by collision with the first of a succession of uranium-bearing targets. Principal author of the radical idea was an eminent atomic scientist and Nobel Prize winner —the late Dr. Ernest O. Lawrence, famed inventor of the cyclotron and director of the University of California Radiation Laboratory. (Biographers, please note; this has never been publicly revealed before.)



COMPARATIVE DIMENSIONS of the Materials Testing Accelerator and the two proposed plutonium-making plants, "A-12" and "C-50," are shown pictorially. The Materials Testing Accelerator represented a "front-end" section of A-12. This sketch, based on data from "MTA reports," is by PS artist. All other illustrations in this article are from the AEC.

Design and construction of a $427,000,000 plutonium plant, code-named A-12, to apply this remarkable process at Weldon Spring, Mo., were actually authorized by the AEC on September 26, 1950.

As events turned out, A-12 got only as far as the paper stage, and the electronuclear way of making plutonium was destined to remain unused. But the secret plan for putting it into practice, which forms an essential part of the Materials Testing Accelerator story, was so novel as to deserve description here.

A-12 was to mass-produce plutonium at a rate of 1,027 pounds, more than half a ton, yearly. Since a five-inch plutonium sphere weighing about 35 pounds has lately been revealed to be the "critical" quantity that will produce a chain reaction, if assembled in the open air, it can be guessed that A-12 would make enough plutonium for something like 29 A-bombs annually.

Housed in a long low building, A-12's super-accelerator would consume most of the plant's power supply of about 400,000 kilowatts. It was to be 1,450 feet long, with a diameter tapering from 57 feet at the front, or injector, end to 44 feet at the target end. Deuterons with the energy of 350,000,000 electron volts, hurled the ⅓-mile length of this vacuum tunnel, would whiz into a cylindrical aluminum chamber holding three sets of uranium targets. First and second targets would be of zirconium-clad uranium plates. The third would be a lattice of one-inch-diameter rods of aluminum-coated uranium. Plutonium would be produced in all three targets, chemically extracted as at Hanford, and refined to silvery metal on the spot. The cost of A-12's plutonium

[Continued on page 252]

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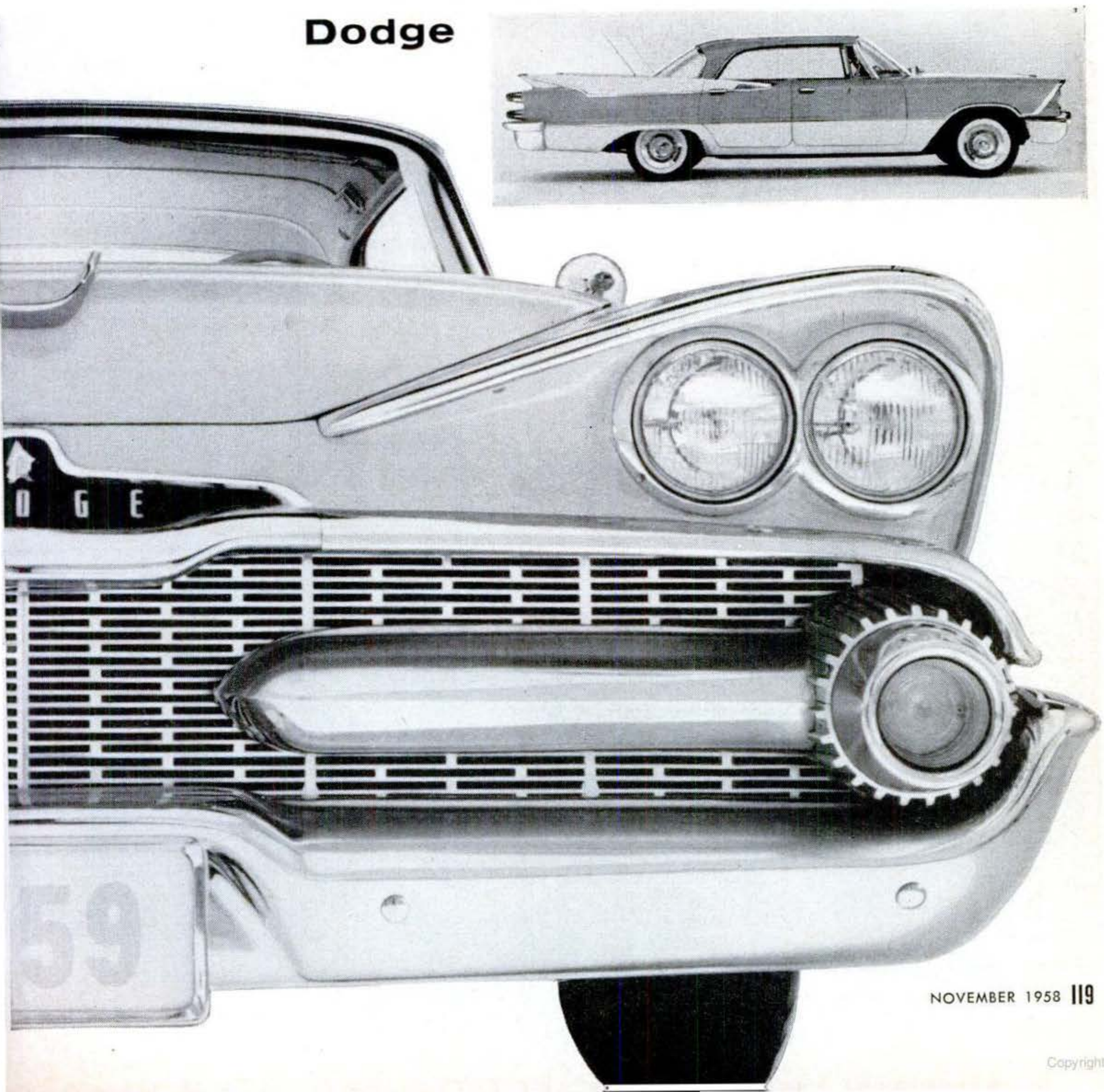
Dodge, Chrysler and Imperial

— Glass, gadgets and glitter

THE man who likes gadgets on his automobiles is going to have a field day with three Chrysler Corp. 1959 cars announced last month—the Dodge, Chrysler and Imperial. Their standard equipment and options include:

- An automatic dimmer that makes the headlight beams bob up and down deferentially to the other fellow's headlights *and* tail lights.
- An outside rear-view mirror controlled from the inside.
- A self-dimming inside rear-view mirror.
- A speedometer that changes color as speed increases. It's green to 30 m.p.h.,



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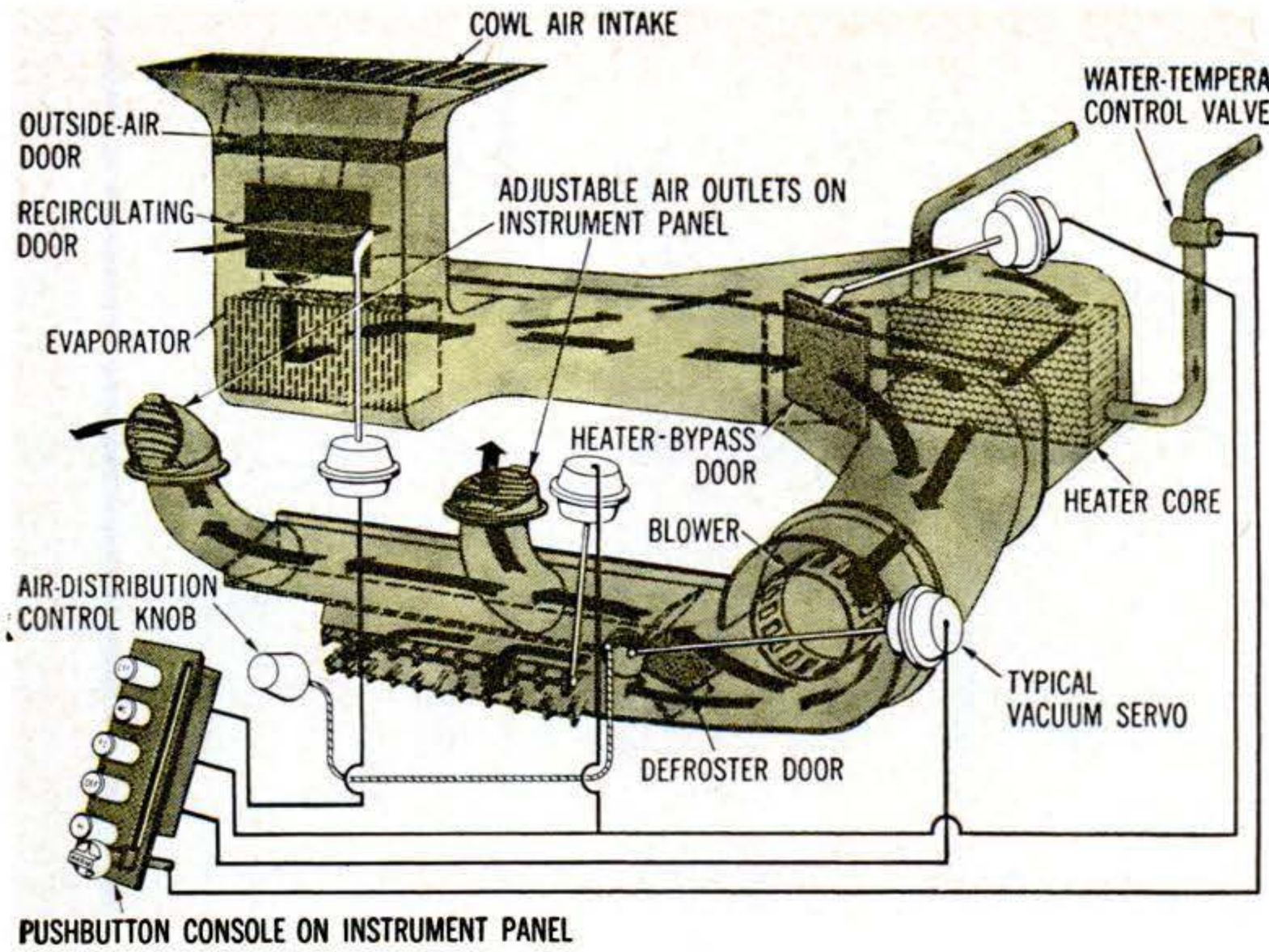


SIMPLE CONTROLS—two knobs and five buttons—work Chrysler Corp. heater-air conditioner despite its seeming complexity. Knobs fix amount of hot water in heater, blower speed and air distribution. Buttons, actuating vacuum-powered servos, supply fresh or recirculated air to cooling unit, fix amount of air through heater and discriminate between heat and defrost.

yellow between 30 and 50, red after that.

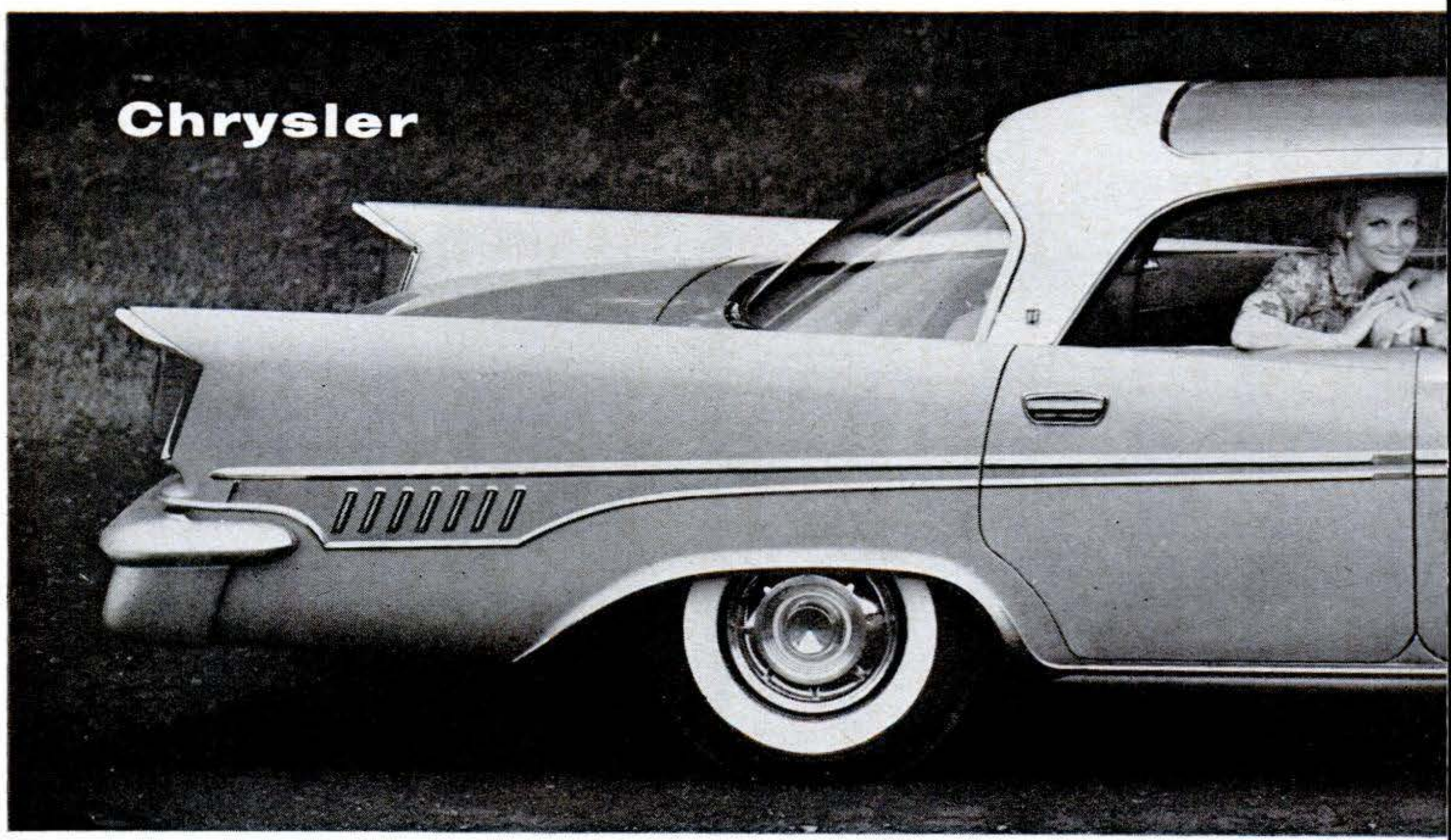
- Pushbuttons for heating and air conditioning.
- A theft-resistant trunk lock, and (as announced for De Soto in September):
- Swiveling front seats.

All this is in addition to four or five dozen ecstatic choices that the U. S. motorist has come to expect—such as automatic drives, power brakes, air springs, engine options and trim combinations.

Like the Plymouth (p. 90), the new Dodge, Chrysler and Imperial are not only gadgety. They are full of glass. The Dodge four-door hardtop alone has more than 30 square feet of window and windshield glass. All the cars abound with ornamental glitter.

Blushing, the company says its swivel seats reduce strain on nylon stockings.

Engines are improved and in some instances are simpler and lighter. Dodge's top horsepower is 345, Chrysler's (New Yorker) and Imperial's 350. END



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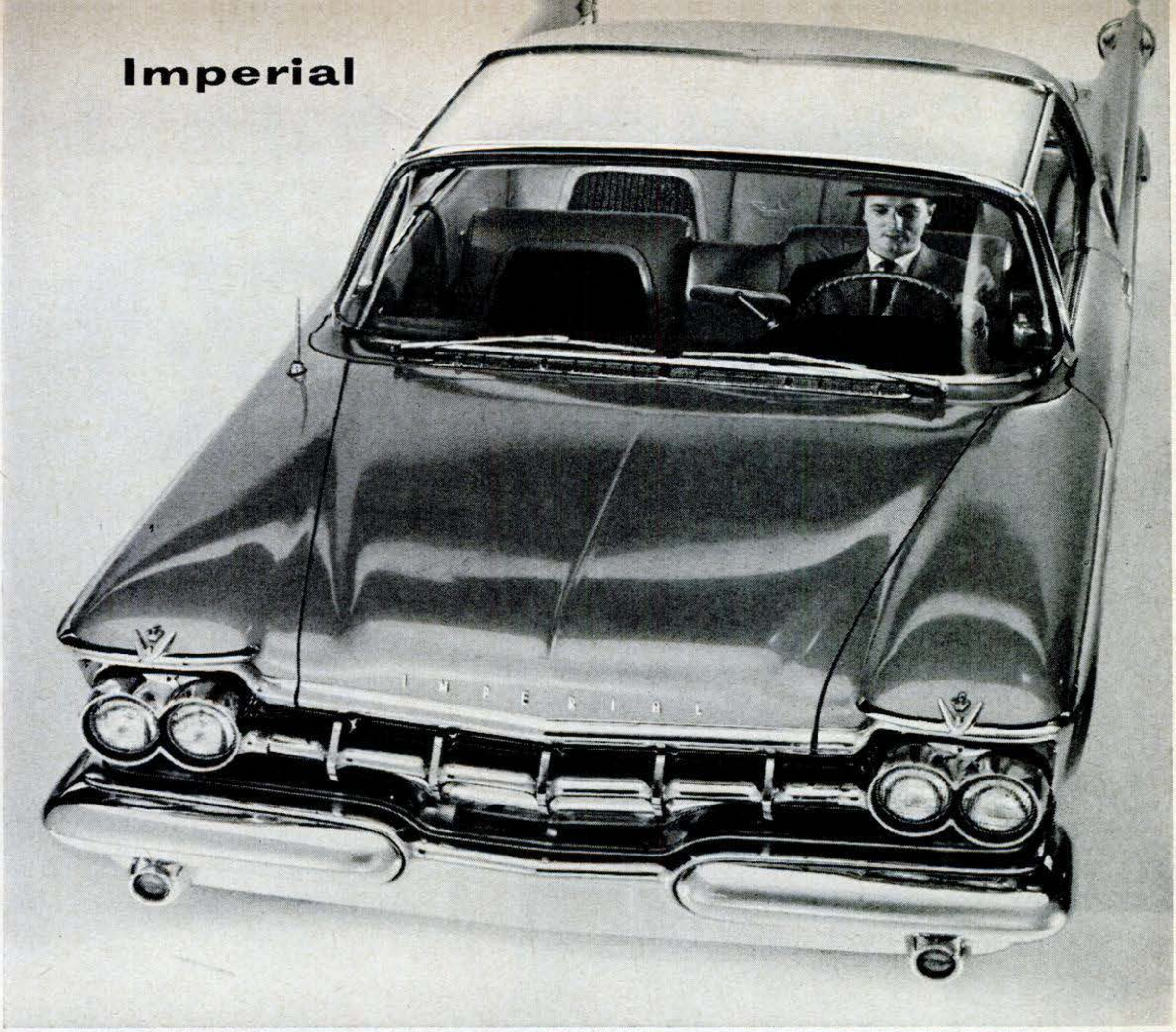
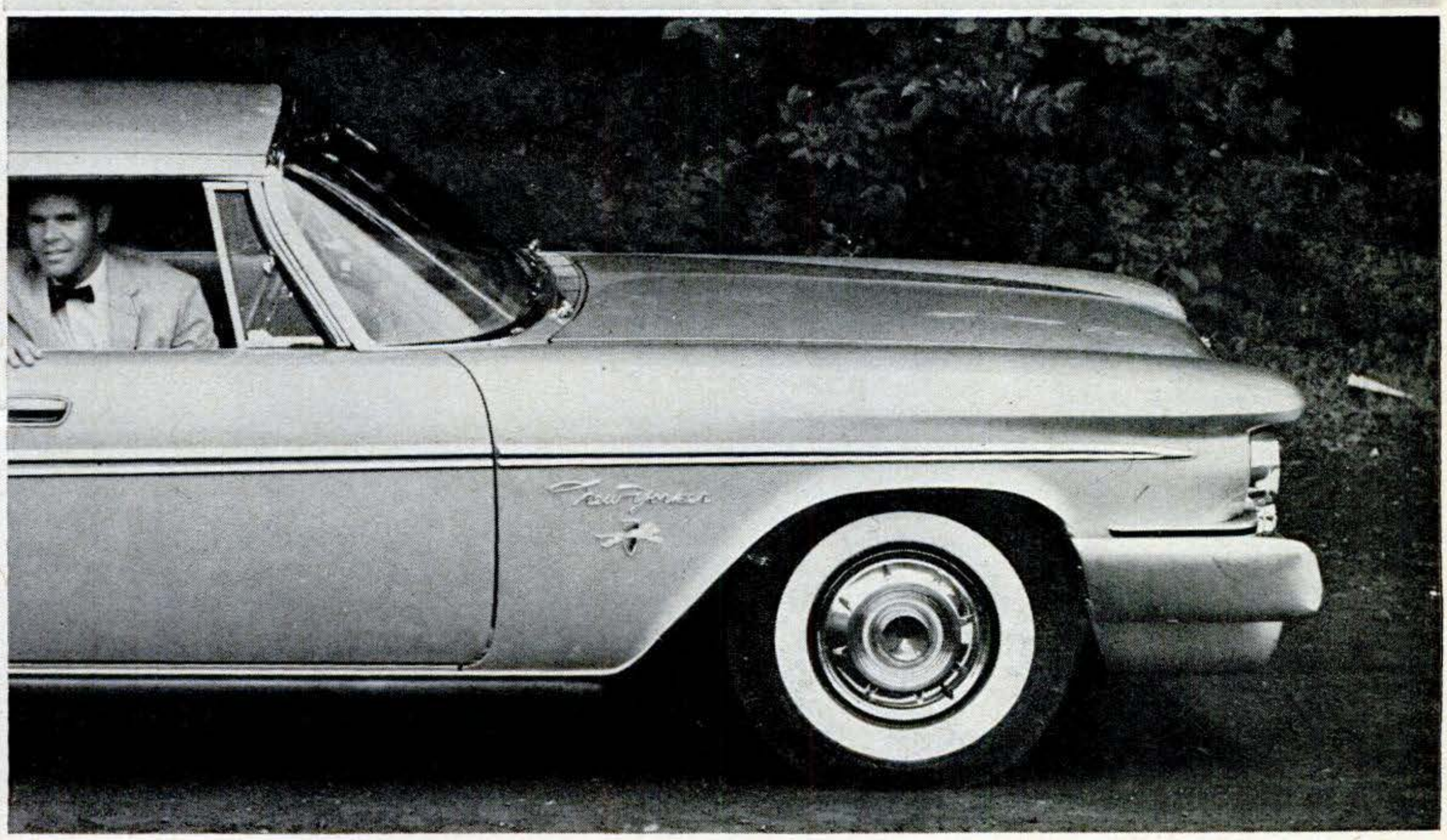
Imperial





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Who's Wearing That

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THESE men are all wearing protective headgear. Can you identify their occupations? Write down your choice—then check the answers below.

radiation snooper. Suit gives him complete head-to-foot coverage; 10. A London bobby in traditional "hardtop"; 11. A racing-car driver—probably after he won a race; 12. A welder. Gas-mask feature protects him from fumes; 13. Supersonic pilot (Air Force); 14. A bee keeper. A fisherman out on a day when mosquitoes are biting would like it, too; 15. Tank crewman. There'd be lots of headaches for a man bouncing around inside a tank without some padding to protect his noggin from that hard steel.

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1. Rocket-launching crewman. Hood is part of a suit that protects him from fuming and corrosive liquid propellants; 2. A boxer who doesn't want to get slap-happy while training for the big bout; 3. A welder, whom Hollywood might well cast for the title role in "The Man in the Iron Mask"; 4. Supersonic pilot (Navy); 5. Man in the Arctic or Antarctic wearing hood of a new covering developed by the Navy to replace bulky, furred parka; 6. Army firefighter. Aluminum coating gives greater protection and weighs less than older gear; 7. Nuclear decontamination squadman. Protection is for men who work on weapons that have fired A-blasts; 8. A football player. Helmet was designed by a dentist who added a plastic jaw covering to protect teeth; 9. Atomic-

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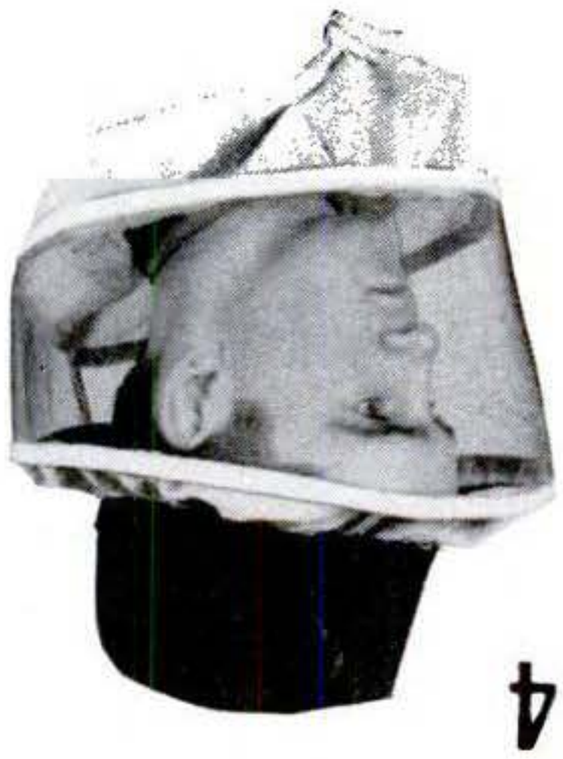

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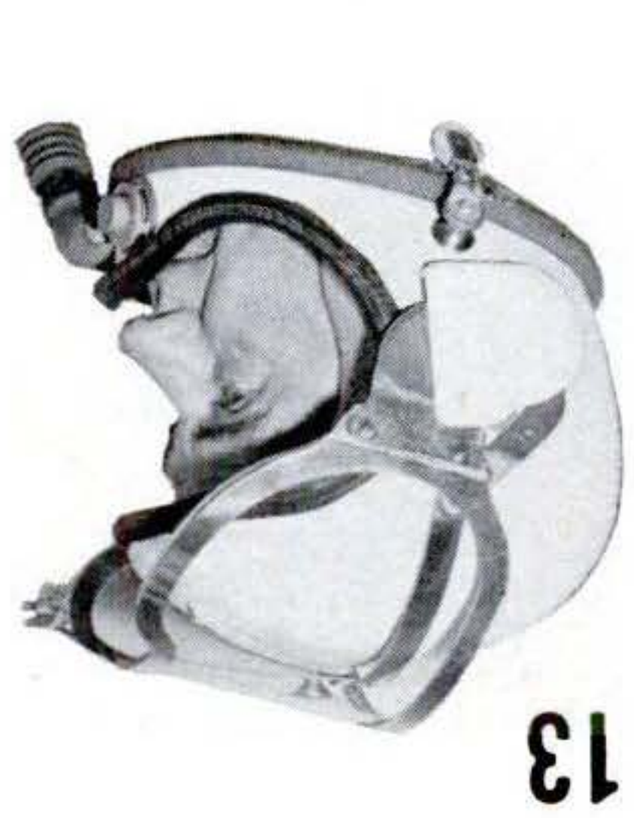

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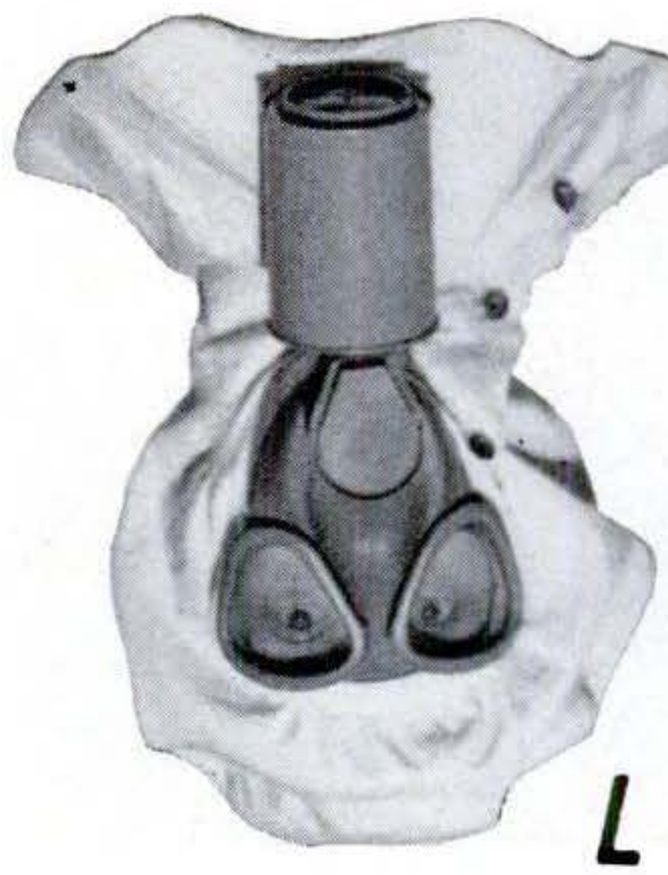

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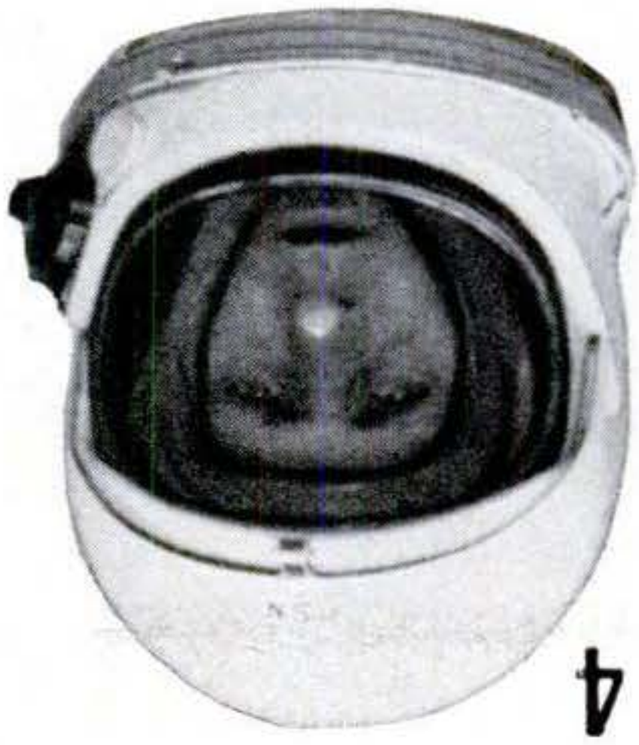

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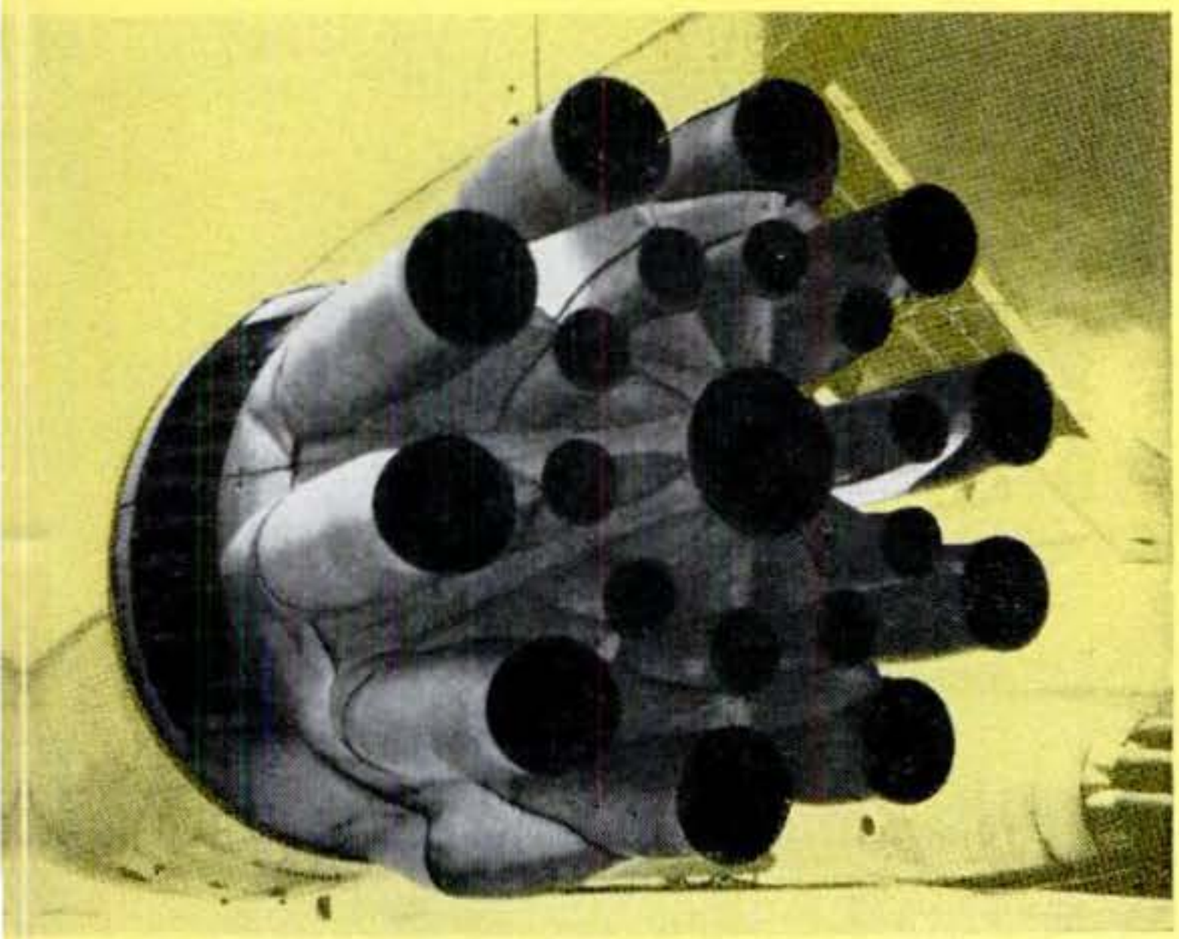
Helmet—and Why?

Muffling the Roar of Those New Jetliners

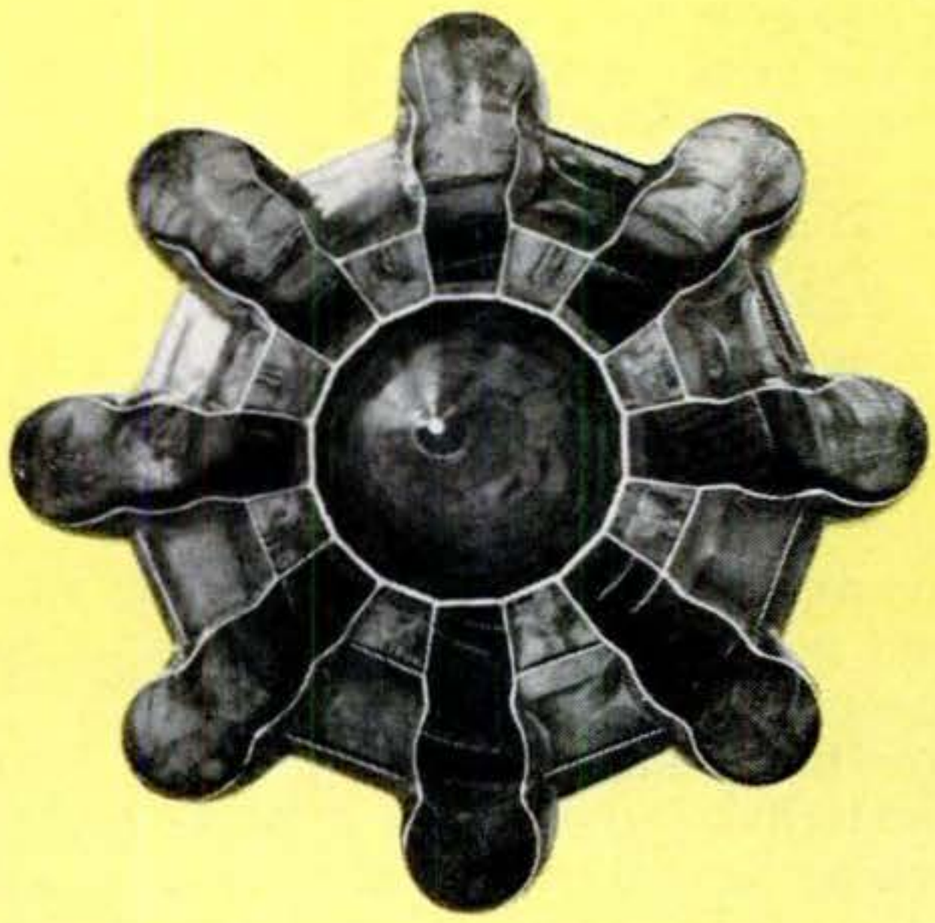
By Wesley S. Griswold

SKY travel is scheduled to enter a wonderful new era this month. If all goes according to plan, Pan-American will send the first U.S. commercial jet airliner whishing across the Atlantic on a passenger flight. In the months following the debut of the four-engine, 150-passenger Boeing 707, a long line of similar planes—twice as heavy, roomy and fast as any we've known before—will start leaping continents and hopping

NOISE: Biggest problem of the new era of air travel



BOEING'S CURIOUS CLUSTER of 21 tubes hushes the 707's jets by breaking up blast into many high-frequency sound waves.



DOUGLAS DOES IT with this daisy-shaped silencer. Feeding exhaust gases through the "petals" cuts noisy air turbulence.

oceans, laden with impatient travelers.

The passengers on that historic first flight will lean back in the bright comfort of a broad, lofty, 100-foot cabin, steady and nearly as quiet as a living room. As they look down upon the remote sea and cloud floes, their plane will seem to hang in space while the earth turns slowly over, 35,000 feet beneath it. If they glance along the leading edges of the wings, they will see, in place of the familiar round blurs of whirling propellers, only the fixed, open mouths of four turbojets. Instead of the insistent roar and contagious tremble of big reciprocating engines, they will hear only a sound like that of a distant waterfall, and feel no vibration.

But while the passengers enjoy this exhilarating sensation of effortless soaring, Pan-American will be the first airline to worry about certain matters that never bothered an airline before.

That unprecedented hush in the cabin, for example. How far can an off-color joke be heard in it? Will the exuberant party in the cozy forward lounge set off a sputter of protests from passengers aft who are trying to sleep? Cross-aisle conversation will be easy—and easily audible to others. Will chatterboxes have to be shut up?

These are relatively trivial anxieties of the jet age. There's a problem that gives airline operators far more concern —one which, if unsolved, could stall jet travel before it ever got started. It's this:

How are the folks on the ground going to react to these big birds—as conspicuous on an airfield apron among the smaller DC-7s and Super Connies as seagulls in a flock of pigeons? Their size will be alluring but what about the noise they make as they fly in and out of the nation's principal airports? For it is a painful paradox that though a large jet plane is exceptionally quiet *inside* during flight, it can be unusually noisy *outside* when it is pushing itself off the ground.

There are two main reasons for that whopping external racket:

- Jet engines are three or four times as powerful as piston engines, though they are lighter and take up less space.
- At maximum takeoff thrust, exhaust rushes out of one of those mighty engines at an incredible speed—765 m.p.h. at sea level. When that torrent of searing gases plows through the cool, lazily drifting ambient air behind the plane, it creates a mighty turbulence. The effect is like what would happen in a pond if you were suddenly to aim a high-pressure fire hose at it.

The jet's exhaust instantly forms multitudes of whirlpools in the air, and those baby cyclones, whamming into one another, cause a thundering turmoil. Not only is this torturous to listen to at close range but its reverberations pummel the chests of more distant bystanders and roll on to shake windows and rattle dishes in adjacent houses.

Airlines were warned long ago by the Port of New York Authority, proprietor of one of the nation's busiest airports, that it would not tolerate any such hurly-burly around Idlewild, which is boxed in by residential areas. Since transcontinental and transatlantic U. S. airlines had to have access to this field, they passed the buck to the plane builders.

Boeing and Douglas, who are making the largest jetliners, set out to find a way to muffle the engines' thunder and limit the travel of the sound. The problem was given to teams of acoustical, aerodynamic, and power-plant experts to solve. Though their approaches vary in detail, essentially the teams came up with the same answer: Give the jets higher voices. Instead of letting them bellow, like their military brothers, make them hiss.

This hiss, you should understand, is far from being as gentle as its name implies. It is like a battery of sandblasters at work. But it is a barrage of sounds of higher frequencies than if no one had tried to shush them. And it is a happy acoustical fact that high-frequency sounds don't carry as far as low-frequency sounds do. They "attenuate faster," as the acoustical engineers say. Furthermore, high-frequency sounds don't set up sympathetic vibrations in structures. They hit and bounce off.

To turn a jet's bellow into a hiss, the experts put a kind of spray nozzle on the high-speed flow of its exhaust.

This sounds simple. But you can't do that sort of thing to a jet engine without interfering with its thrust. Moreover, when you add width or length to an engine nacelle, you increase a plane's drag.

Lowering thrust and raising drag immediately play hob with flight require-

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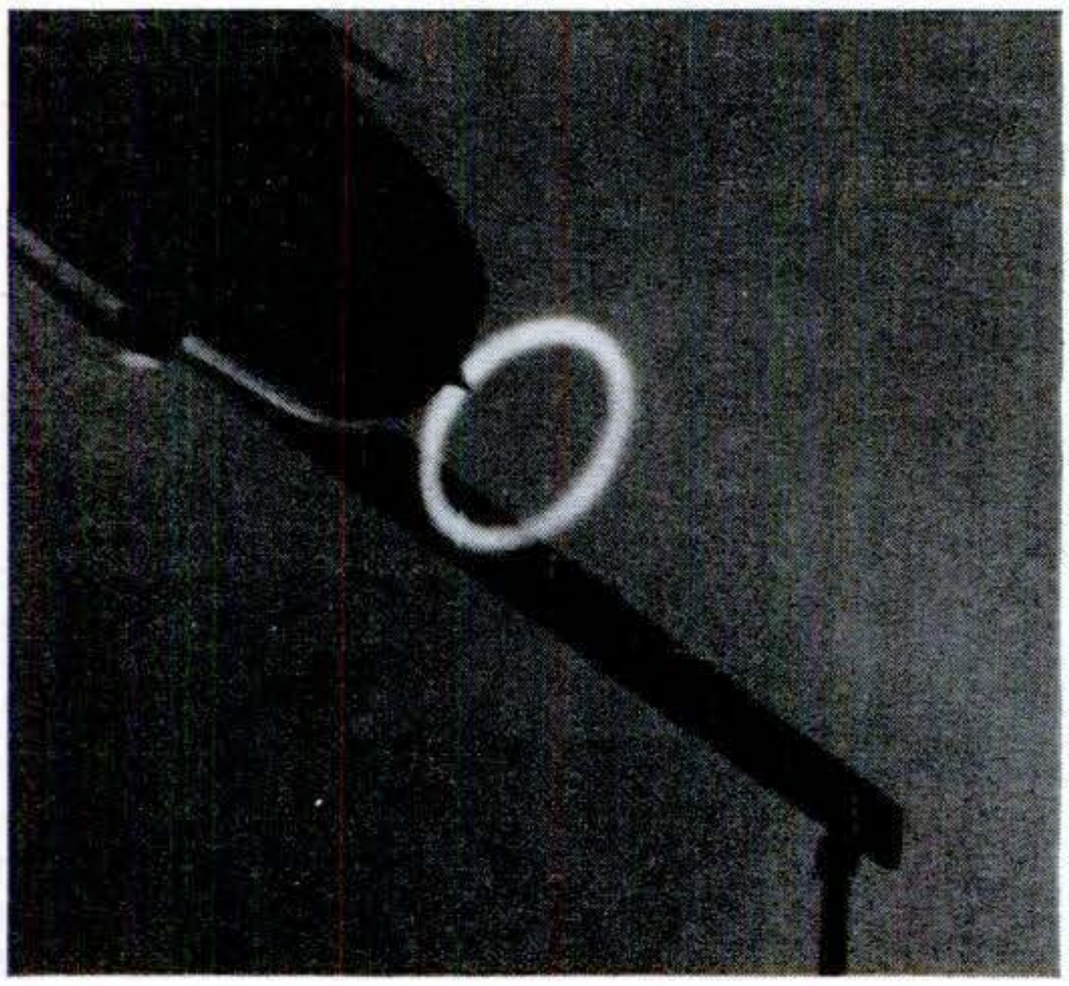
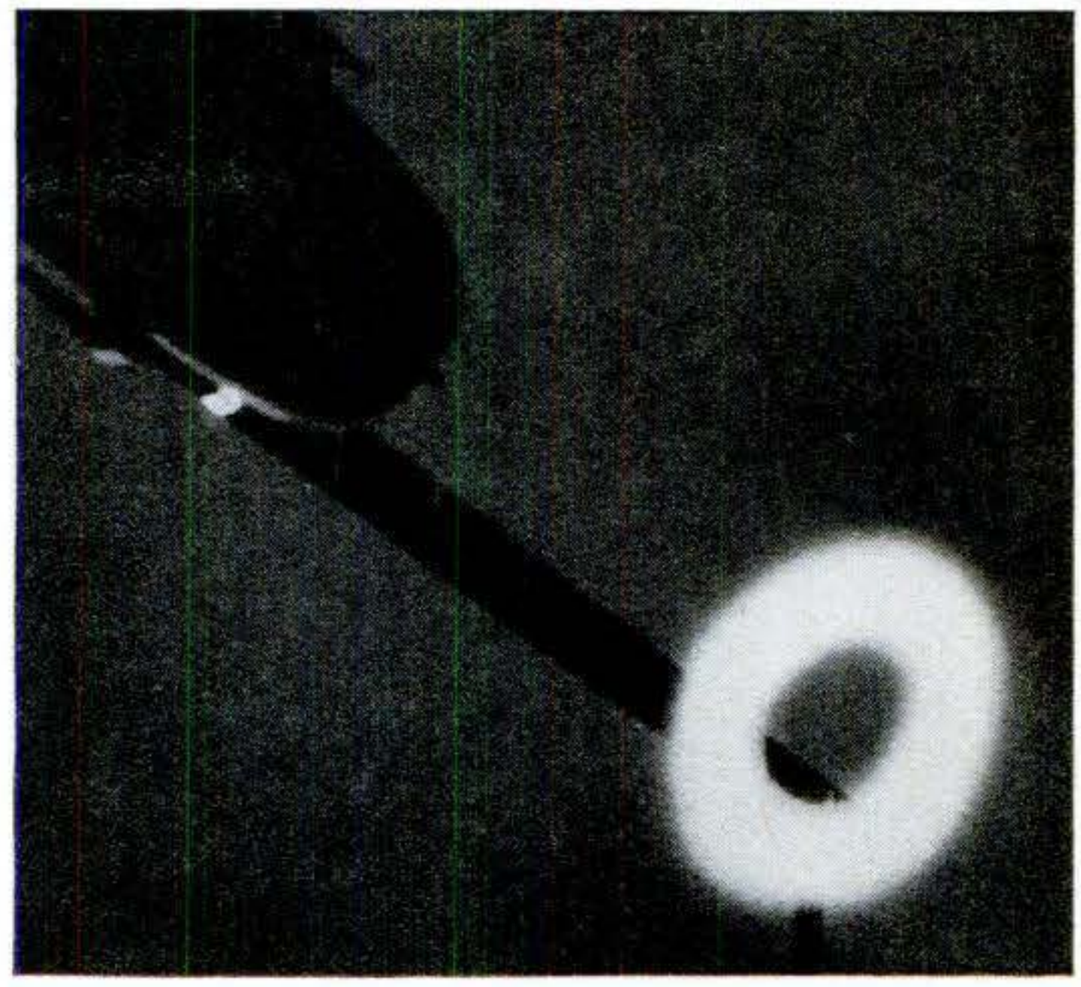
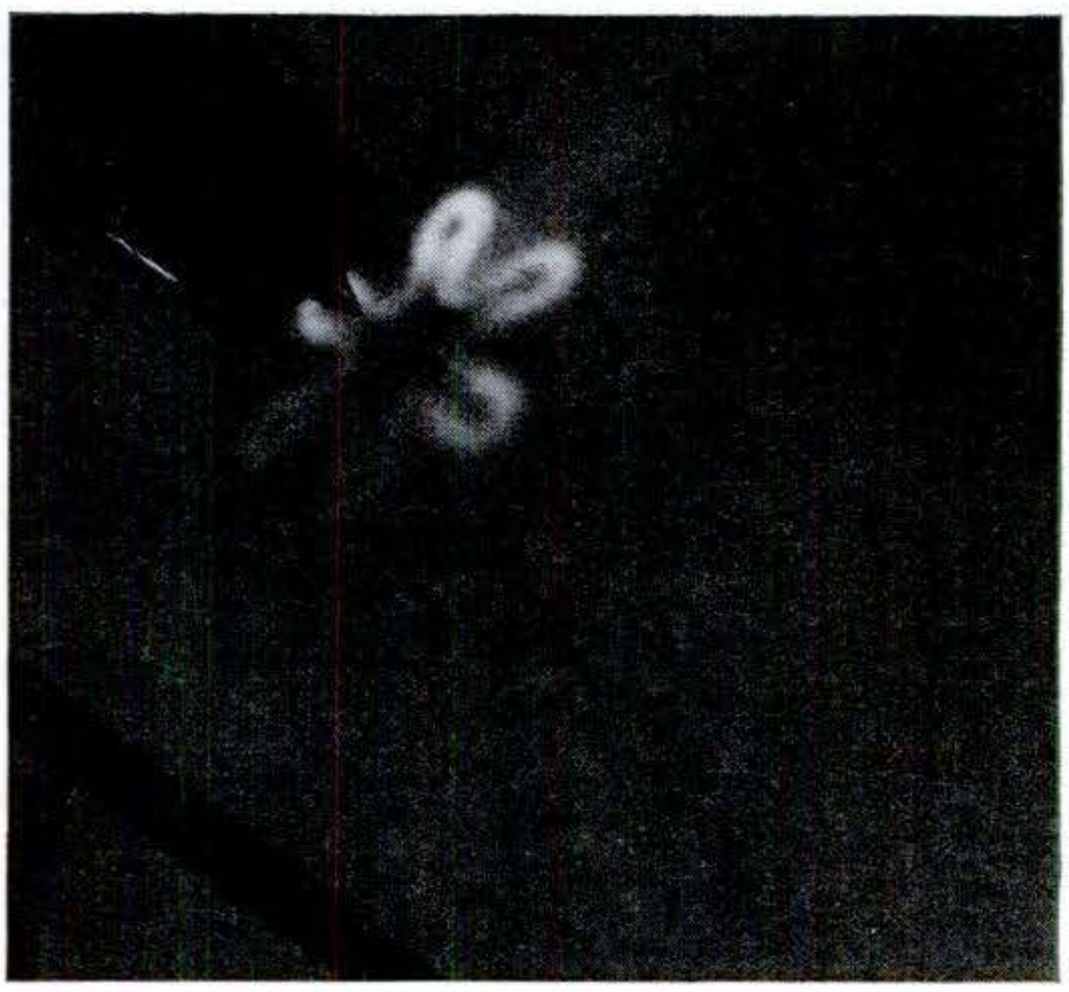
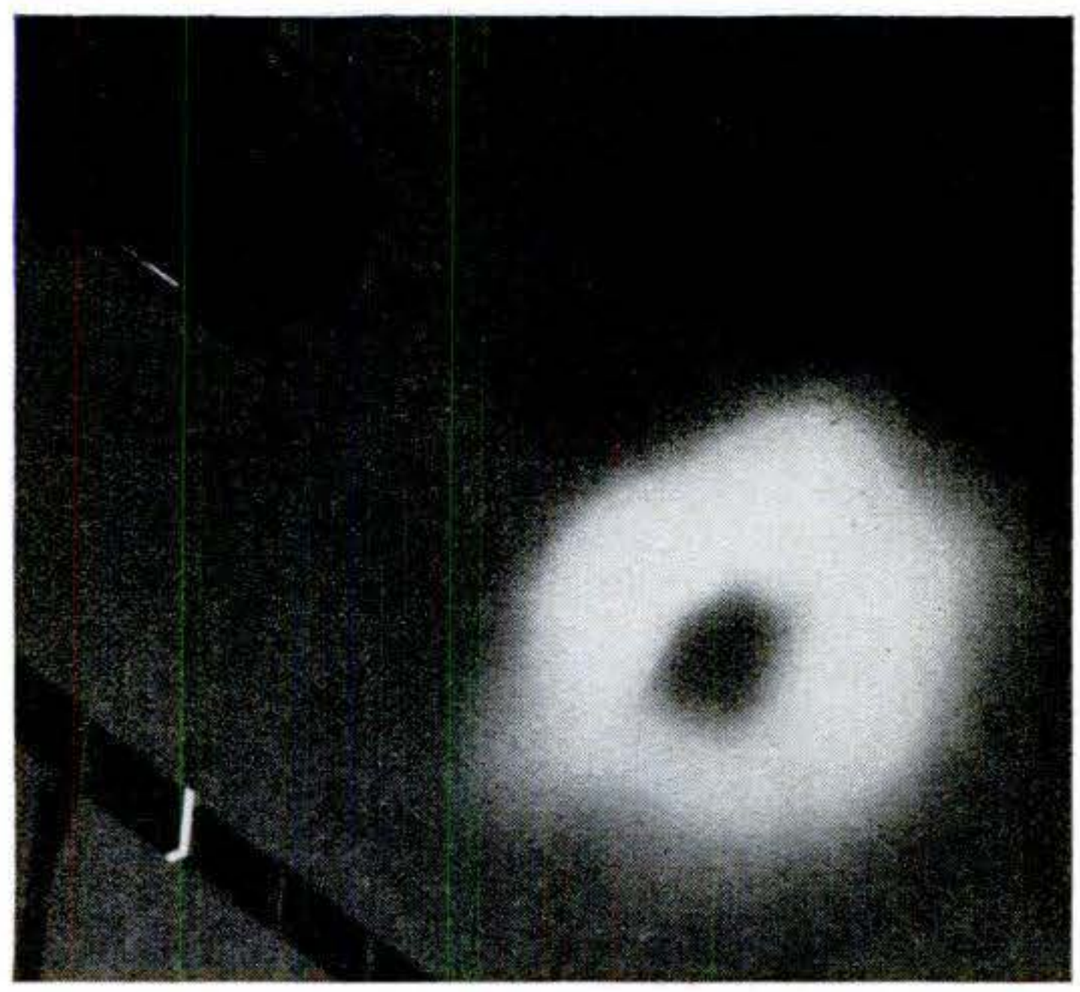
Engineers blow smoke rings to make sound visible for study









NOISE IN MOTION: Top two pictures show exhaust from unsuppressed jet engine. Bottom pair shows jet equipped with sound suppressor that diffuses jet stream to mix faster with surrounding air, reducing bellow. Photos were taken for Douglas engineers by saturating the atmosphere around the exhaust with oily vapor, and passing a powerful beam of light through it.

ments vital to an airline: range, payload, speed. For example, to the front office a one-percent loss in range means that 670 pounds of weight—in passengers, fuel or freight—must be left behind, or flights must be shortened.

Caught in this excruciating squeeze between the need to quiet their jet airliners and the need to make them pay, the buyers could only demand that the plane manufacturers find some way to assure them of both goals.

Boeing's hardware for the job is now appearing on its hefty, handsome 707 jet transport. The sound-suppressor is a bundle of short, fat, slightly tapered tubes. It is fastened over each engine's single exhaust port, two feet in diameter. In place of that one original exit for combustion gases, the Boeing suppressor provides 21. There is a central tube 10 inches in diameter. Around it is a circle of 10 tubes, each four inches across. And around that is another circle of 10 tubes, each 6¼ inches across.

As the engine exhaust belches through these 21 tubes, narrower and longer than its original exit, it creates far smaller whirlpools in the surrounding air than it did originally. The resulting noise is of much higher frequency than that of an unsuppressed jet engine. There is less of it, too. Astonishingly, sound-level tests have shown that the Boeing 707 makes

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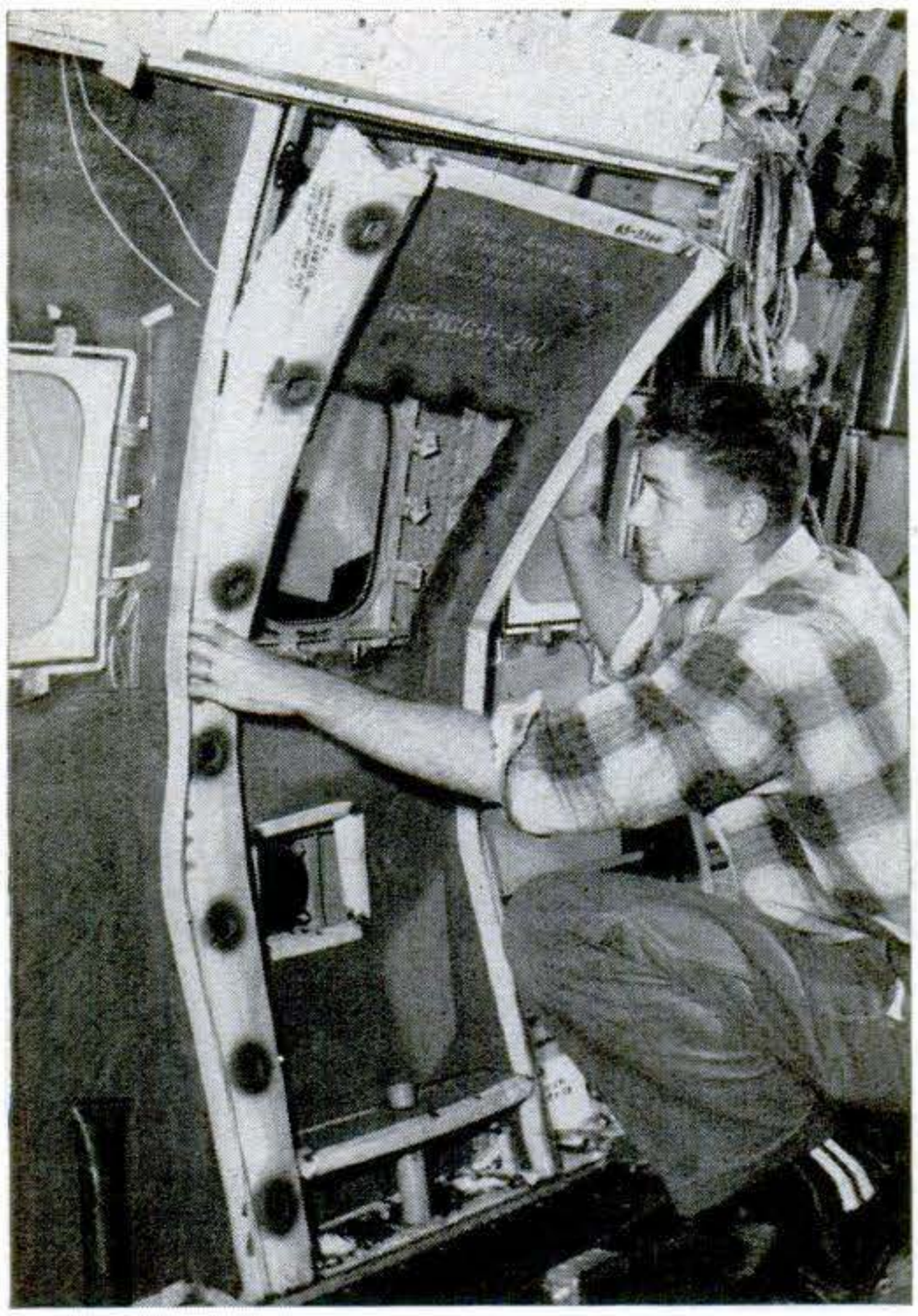

QUIET, PLEASE. Boeing has hushed noise remarkably in 707's cabin by placing preformed glass-fiber batts and rubber isolator mounts between plane's outer skin and inner panels.

slightly less total noise than the biggest piston-engine planes we are used to.

Will it sound quieter to you? Maybe not, because it is a distinctly *different* sound. People who are accustomed to listening to military jets will be impressed by how much quieter the sound-suppressed passenger jets are. But those who normally hear only the drone of reciprocating engines in the sky will instantly know that a new note has been added to the sounds overhead.

Three years of exacting and often frustrating experiment led to Boeing's final sound-suppressor design. More than 550 models, in an incredible variety of patterns, were made and tested. One even had 253 exhaust ports. It quenched sound enormously, but it also reduced thrust by an appalling amount.

What damage, if any, did sound-suppression ultimately do to the 707's flight performance? Boeing guaranteed the airlines that the penalty for muzzling the sound enough to satisfy the Port of New York Authority would be limited to a four-percent loss in range, with two-percent loss in thrust at takeoff. Boeing says it has done better than that, but the amount is an airline secret. Loss of thrust at takeoff is a big penalty, because the faster a plane can climb from the runway, the quicker it gets above the noise-annoyance level for nearby residential areas.

Douglas is hard at work, too. Their sound engineers have been trying as long and as hard as Boeing's men to smother the noise of jet engines without serious loss of thrust. But they have one important advantage over their rivals—more time to devote to the problem. Douglas' first DC-8 to take paying passengers aloft won't be flying for another year.

There had to be an interim sound suppressor available for test flights of the DC-8, however. That model, a splayed cluster of seven pear-shaped tubes around a circular central tube, is at work in the air almost every day. Each of the outer tubes contains a toothy duct, leading into it from an outside opening. As exhaust spurts from these tubes, it draws in surrounding air through the ducts and mixes with it. Douglas engineers say this device suppresses jet sound about as well as the Boeing 21-tube nozzle.

But the Douglas acoustics experts have gone on beyond this temporary solution to one they feel is even more promising.

Their sound suppressor for the first DC-8s to go into commercial use looks rather like a metal daisy. It has eight petal-shaped openings that radiate from a circular center, which rings the protruding cone at the rear of the jet engine. Exhaust gases pouring through this strange array of exits mix quicker with the surrounding air than ever before. This situation reduces sound levels below any previous figure.

As a final touch, Douglas has added what is called an ejector. This is an engine cowling that moves to the rear of the sound suppressor at takeoff and forms a short tunnel for the exhaust to pass through as it leaves the suppressor. The strong suction created around the lip of the ejector pulls in ambient air around the lobes of the "daisy" and mixes it with the exhaust in the ejector, thus increasing the mass of air that rushes out the rear. This suppresses noise still further. What's more, the Douglas men proudly claim that the aerodynamic flow

[Continued on page 244]

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Scientists, worried about the current suicide rate, mobilize to seek the causes and possible preventives of—

The Killer We Don't Talk About

SUICIDE is listed officially as the cause of at least 16,000 deaths a year in this country—very nearly half the well-publicized toll of traffic accidents.

Medical researchers are certain that the *actual* toll of suicide is much higher. They suspect it of being the hidden cause of many an otherwise inexplicable auto crash. They also think that a suicidal urge may be at the bottom of the many millions of disabling accidents, of all kinds, that occur every year.

"Once a minute, or even more often, someone in the United States either kills himself or tries to kill himself with conscious intent," Dr. Karl A. Menninger, one of the nation's most famous psychiatrists, has declared.

Giant campaigns have been launched against America's other chief killers. But there has never been a concerted attack on suicide. In the past only a few men have ever probed deeply into this widely avoided subject, for suicide is one of the taboos of our time.

Now, however, U. S. scientists are beginning to mobilize against the killer we don't talk about. The first step has been to collect and analyze statistics. So far, many strange facts have been discovered. The reasons underlying them are still largely mysteries, and answers must be guessed at. But it is only by facing the facts, the researchers emphasize, that we can find ways to corner and disarm this deadly public enemy.

Most people, perhaps, at some time in their lives have thought fleetingly of killing themselves. Surveys of several hundred healthy and apparently normal people in Chicago, New York, and Boston have tended to confirm this. At least 80 percent admitted having had the notion of suicide. But it is when this commonplace notion turns into an obsession that it becomes dangerous.

WHAT do suicide statistics disclose? The patterns are curious:

- Three times as many men kill themselves as women.
- The older men grow, beginning at the age of 15, the more prone they are to suicide. (This is true of women also, but only until they reach their fifties.) Most suicides are between 40 and 59.
- Race, financial and social status, and even occupation all seem to be factors. Thus three times as many whites as Negroes kill themselves. Proportionately, more military officers than enlisted men take their own lives, and relatively twice as many doctors as all other males. Suicide is most common among people of better-than-average income. Ministers and miners are the men least likely to do away with themselves.
- Some findings confirm popular opinion. The suicide rate rises when business is bad. It is highest in the big cities, lowest in country districts. And it is higher among divorced or unmarried people than

A noted psychiatrist comments on this article

I found this article on suicide readable, interesting and accurate . . . I am glad that POPULAR SCIENCE *is indicating the possibility and desirability of more careful attention to this important avenue of social and human loss.*

—Karl Menninger, M.D.
The Menninger Clinic, Topeka, Kan.

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among those living with families. Yet, oddly, it drops in time of war.

RESEARCHERS have attempted to find connections between suicide and geography, weather, even the day of the week. Here too the results are interesting but also perplexing.

Vermont led the rest of the country in 1956 in the percentage of suicides. But before generalizations are attempted about its dour, mountain-hemmed population, it must be remembered that Vermont also consistently has fewer murders per capita. On the other hand Alabama, which has only half as many suicides as the average state, has 2½ times as many murders.

Gloomy weather is sometimes blamed for causing depressed people to end their lives. This theory seemed to be bolstered by the fact that Seattle, a notoriously rainy city, was found in one study to have a suicide rate 2½ times higher than the national average. Then the same study upset the weather theory by revealing that self-destruction was more common in the driest states than in the wettest.

WHEN does a man kill himself? It might seem likely that dreary, chilling winter days, or weekends spent in solitary brooding, or the lonely night hours are times when this act of despair is most common. But they are not. Doctors at the Harvard School of Public Health discovered, astonishingly, that people the world over are far more likely to kill themselves on a sunny Monday or Tuesday morning in spring or summer.

This paradox is explained by Dr. E. M. Jellinek, of Texas Christian University:

"When one is depressed, the never-ending daylight is difficult to bear and the glorious sun becomes a curse. The fireside, the slippers, and the waiting bed help to protect the depressed person from himself. This line of retreat recedes as the day grows longer."

Scientists inquiring into the causes of suicide start with a formidable handicap: Rarely is there any really conclusive explanation. The families of those who take their own lives are usually either bewildered by the act, or too overwhelmed with remorse or shame to tell what they know of the reasons for it.

FEW of the people who kill themselves leave notes. This fact was discovered in the most intensive research into suicide ever conducted in this country. Drs. Edwin S. Shneidman and Norman L. Farberow, in the course of a three-year study, gathered 721 suicide notes written in Los Angeles County from 1944 through 1953. These were nearly all that had been written, but they related to only 15 percent of the county's suicides in that period.

In some instances, case histories and psychological tests of the note writers were obtainable. From their long perusal of this mass of material, Shneidman and Farberow learned certain striking facts, reported in a recent book, *Clues to Suicide*. They found:

1. Three-quarters of the men and women who killed themselves had tried or threatened to do it before. Thus, the adage that a person who talks of suicide never commits it is tragic nonsense. Suicidal gestures must be taken seriously.

2. Nearly half of the persons who committed suicide did so within three months of an emotional crisis from which they seemed to be recovering. Doctors and relatives of someone who has tried to kill himself must therefore be especially on the watch for a new crisis for at least 90 days after the person appears to be improving.

3. One who threatens suicide seems to be more disturbed emotionally than one who actually tries it and fails. But both must be observed carefully for at least three months.

4. Prompt professional treatment of a potentially suicidal person may mean the difference between life and death.

PSYCHOLOGICAL treatment takes many forms today. In case of threatened or attempted suicide, electric-shock treatment is now often used. This is given with much the same promptness as an emergency operation might be performed on someone with a critical physical ailment. Science hasn't yet found out why a charge of electricity at least temporarily knocks out a suicidal mood, but it does so in a remarkably large percentage of cases. Its long-range benefits are less impressive, however. An 18-year continuing survey of the results of electric shock on

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923 patients of the Royal Edinburgh Hospital for Mental and Nervous Disorders made it clear that while the treatment usually helped, it didn't produce cures. In some cases, it made the patient worse.

Fortunately, there are less extreme warnings of potential suicide than threats or attempts to take one's life. Psychiatrists agree that deep and persistent melancholy, repeated mention of a feeling of hopelessness, complaints of suffering, withdrawal from social contacts, an exaggerated feeling of insecurity or inadequacy, excessive drinking, chronic sleeplessness, inability to concentrate and loss of weight are all danger signs that demand alert attention, especially when two or more of them are combined.

WHAT reduces a human being to this low ebb of existence? There are many, many contributing causes, and much disagreement among scientific authorities about the relative importance of those causes.

However, from their studies of 7,000 suicides, Shneidman and Farberow decided that there are four types:

1. Those who have delusions or hallucinations. If inner voices tell these persons to kill themselves, the researchers declared, it is practically impossible for anyone else to anticipate their act.

2. Those who long to put an end to extreme physical or psychological pain.

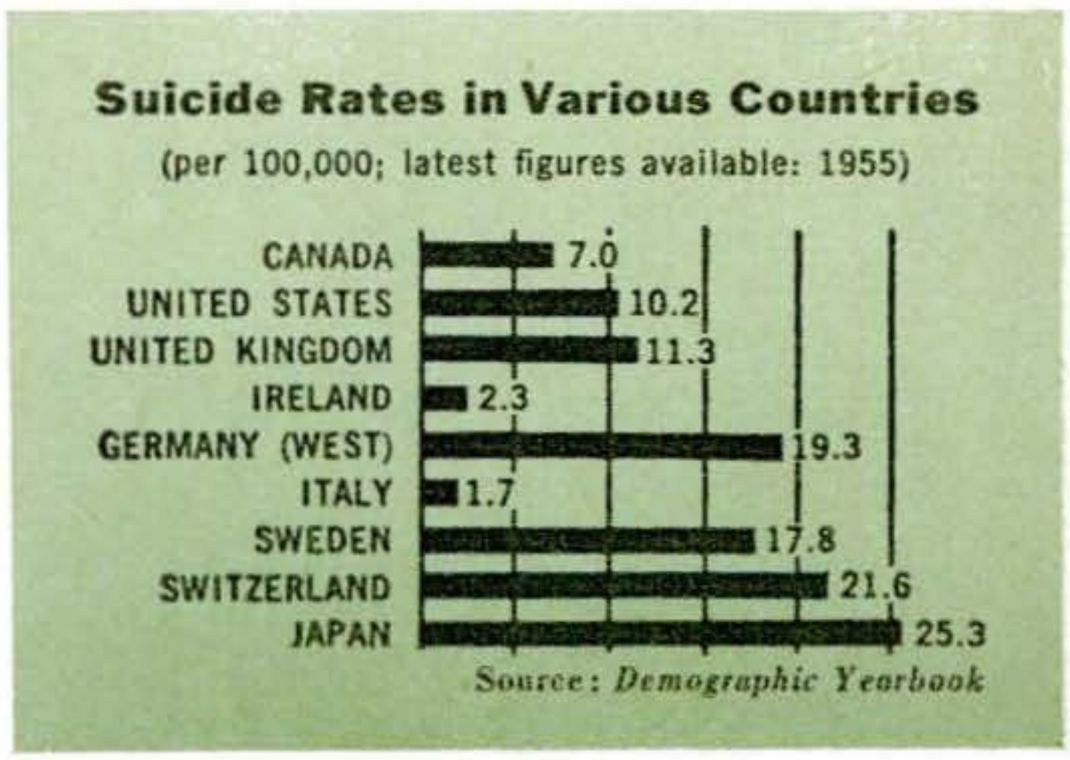
3. Those who kill themselves because of their beliefs, as for many centuries Japanese have done under certain desperate circumstances. This class also includes those who want to die because of intense belief in an after life.

4. Those whose suicides represent an effort to solve conscious or unconscious feelings of hate, guilt or a need for love.

There may be elements of all four types in every suicide, the Los Angeles psychologists stated, but each type requires a different treatment.

THE seeds of a future suicide are planted in early childhood, Dr. Sigmund Freud believed. The basic, conflicting emotions in each of us, he said, are love and hate. As our parents discipline and frustrate us in some respects, comfort us with protection and affection in others, our feelings toward them are a turbulent blend of satisfaction and resentment. If our personalities develop in a normal, healthy manner, love wins out and hate-bred aggressiveness spends itself in sports, economic competition or crusades against the world's injustices. If we have childhoods clouded by parental severity and rejection, resentment grows.

Cultural influences restrain us from expressing our resentment in violence toward the object of it. Instead, our minds are swept by waves of guilt at harboring such vicious thoughts, and guilt spawns morbid convictions that we must be punished for our evil wishes. And, the tortured mind advises, the logical one to do the punishing is ourself.



This explosive situation may not, of course, lead to tragedy. It may dissipate under the soothing influence of a happy marriage, prestige or financial success. But let the sick personality become isolated in a strange, heedless city, or be subjected to sudden loss of love, money, position, health or self-confidence, and catastrophe may come swiftly.

These general ingredients of suicide have long been suspected. Today's research has more specific goals.

"WHAT we're trying to learn is not so much why people commit suicide as how they act once the idea of suicide takes hold," Dr. Shneidman says.

"We believe there are definite signs that indicate suicidal attitude. We hope to make these signs so explicit that they can be recognized for what they are and the individual can get the care and understanding that could save his life."

—*Wesley S. Griswold.*

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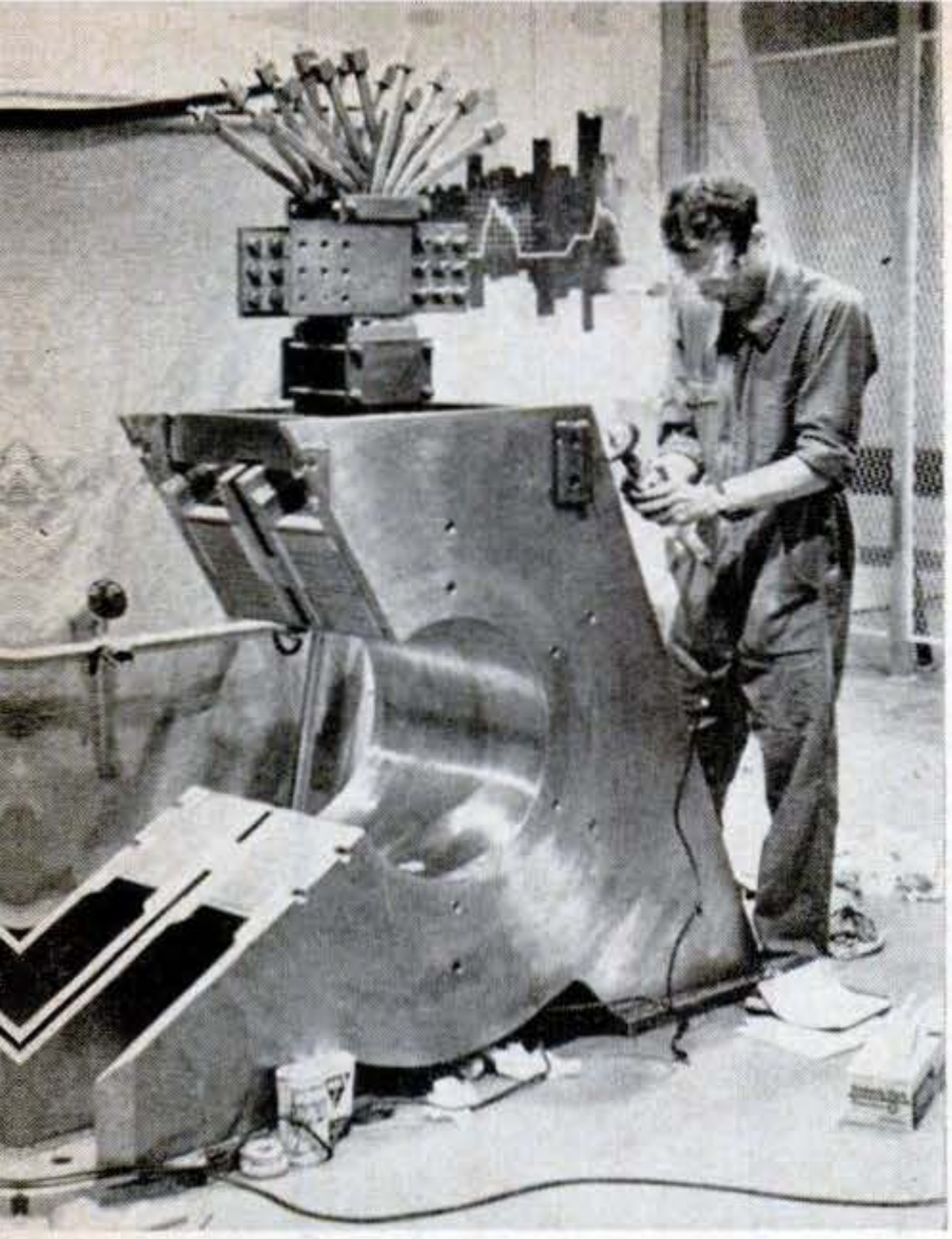

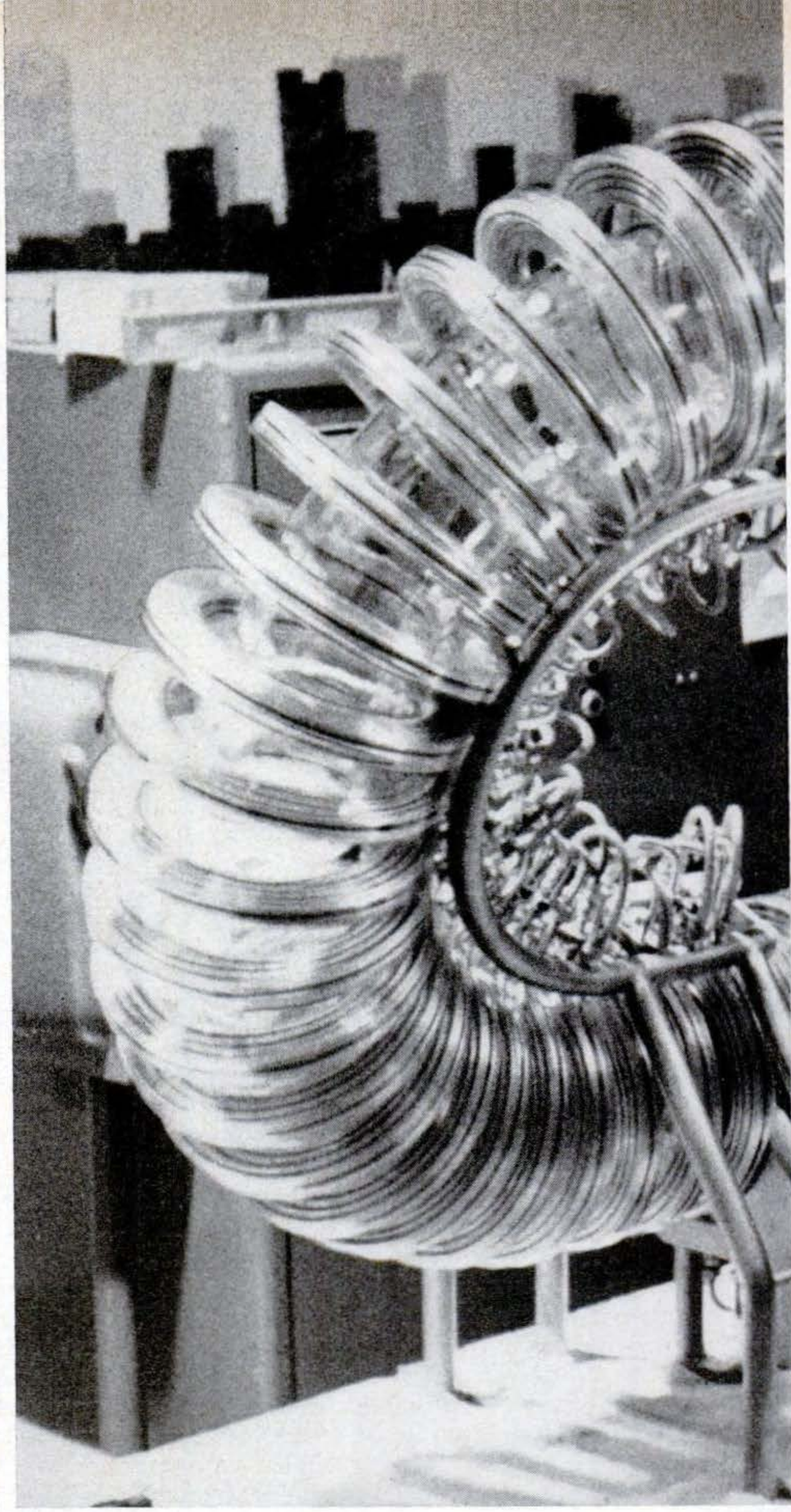

New twist in H-power. This pretzel-like "magnetic bottle" is a Stellarator—a long-secret device being developed at Princeton University to tame the H-bomb's reaction for useful power. Called the Model B, the one in the large picture is the forerunner of the biggest U. S. thermonuclear machine—the Model C Stellarator, to be ready in 1960.

Stellarators use a strong magnetic field from external coils to hold a plasma, consisting of ionized particles of heavy hydrogen, at the center of an endless tube. To kindle an H-reaction, they raise the plasma to starlike temperature, in two stages—first by resistance heating, then by a novel method called magnetic pumping. Model B's figure-8 design

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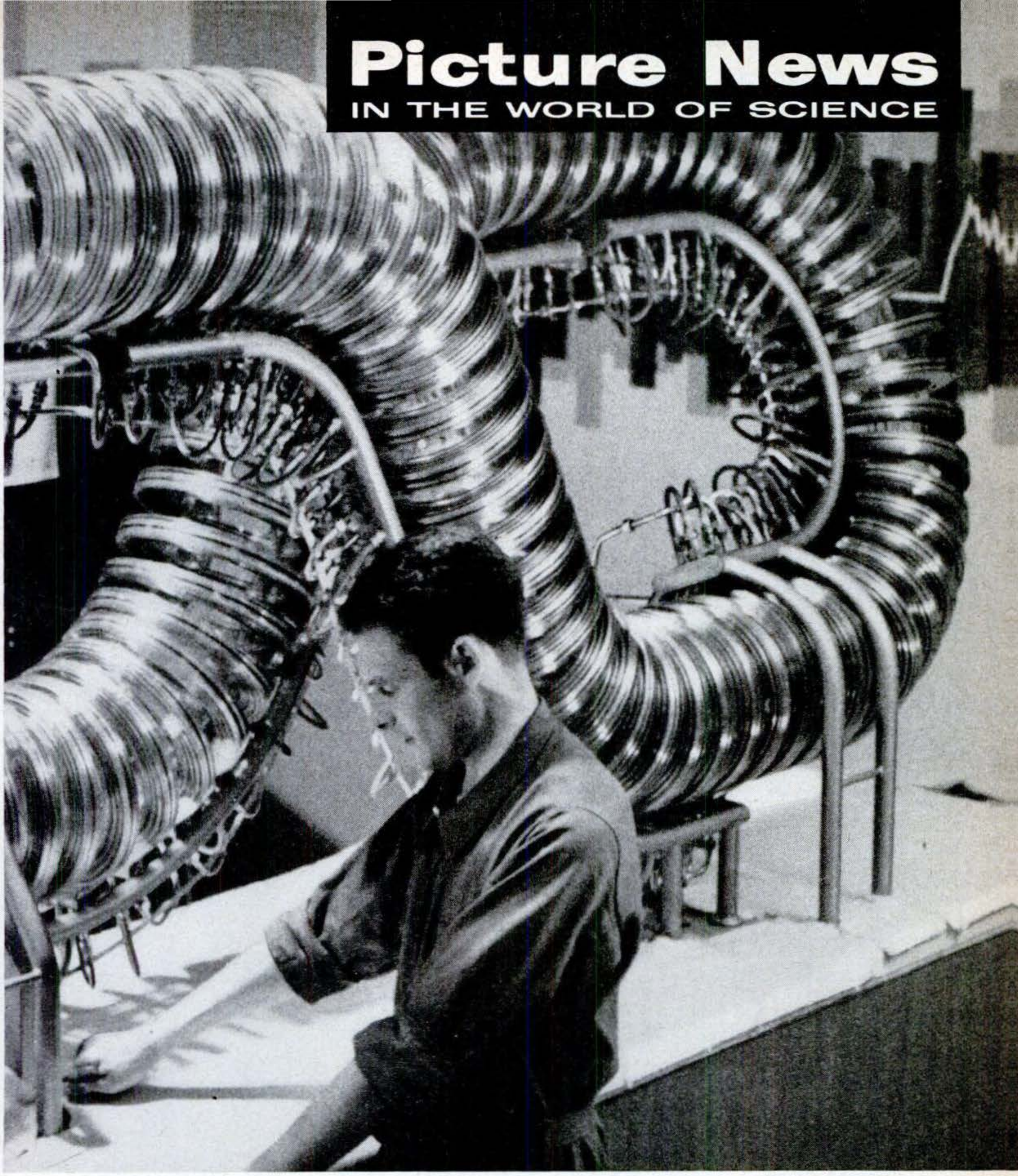
Picture News
IN THE WORLD OF SCIENCE



helps confine the plasma. But a newer refinement, an extra set of magnetic coils, untwists a Stellarator. So the big Model C will be racetrack-shaped, with a tube of about 40-foot circumference and eight-inch bore. One of its massive magnetic coils is pictured at top left.

Unveiled with these, at the recent Geneva peaceful-atom conference, were two new Los Alamos H-machines. Scylla (middle left) hurls a 600,000-ampere thunderbolt at a small ceramic tube, in which it heats plasma to millions of degrees. "Magnetic-pinch" effects, like those of England's three-foot-bore Zeta machine, are studied with Columbus ST-1, nicknamed "Sewer Pipe" (bottom left).

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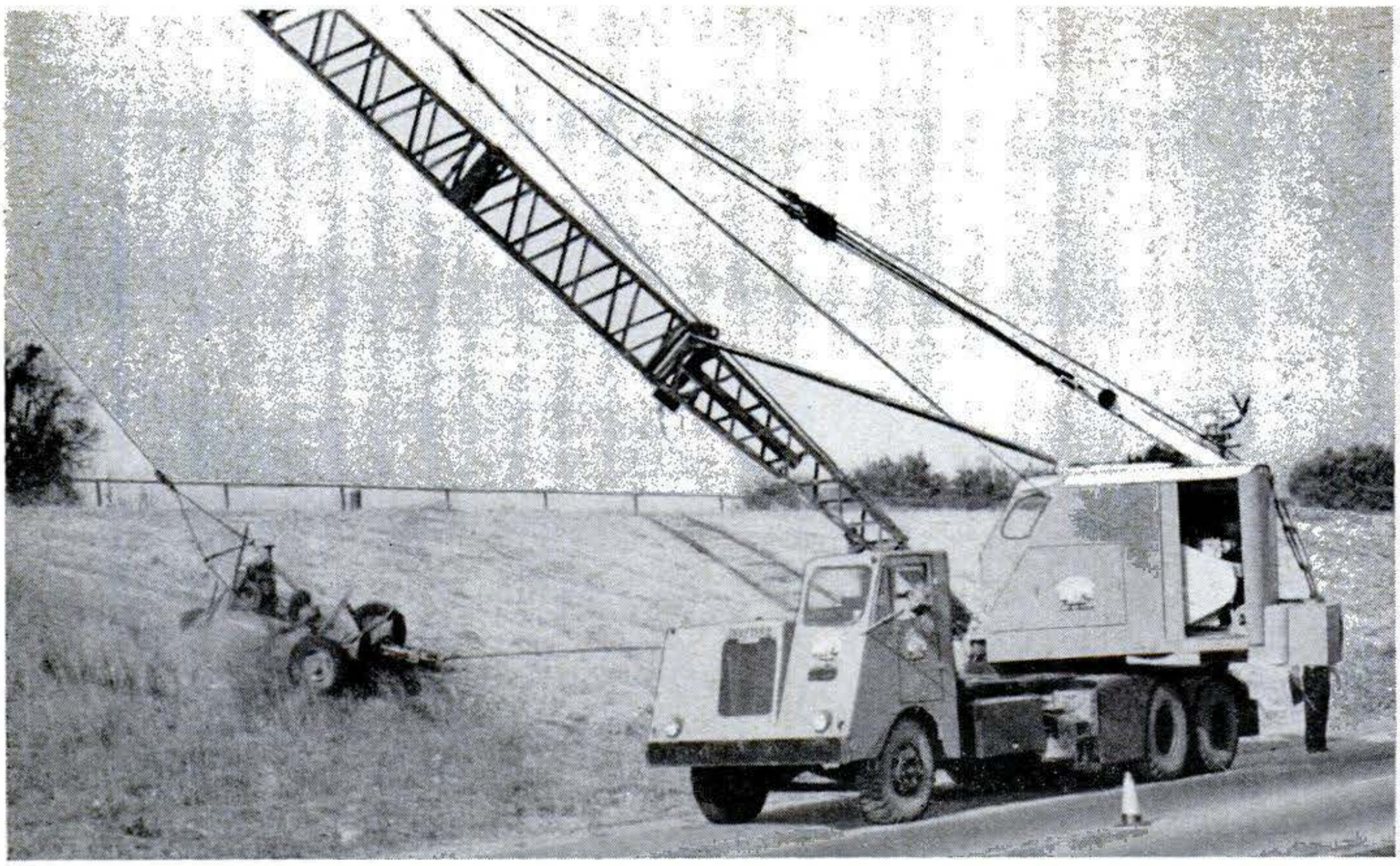
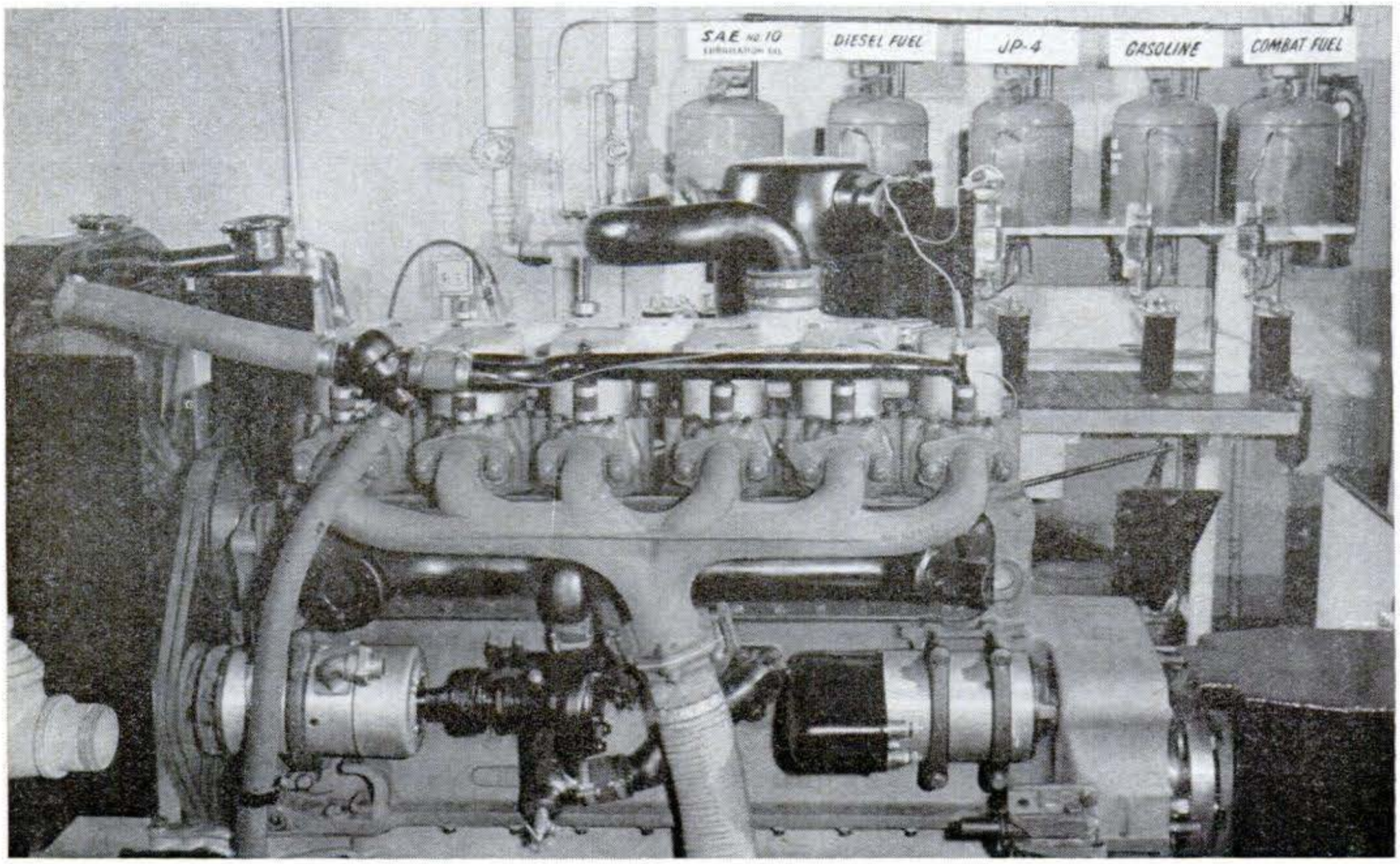


Roadside lawn mower gets assist. Hoisted up the sides of steep shoulders and hauled or "jumped" back for a new cut, this crane-guided 60-inch rotary mower helps keep California highways trim. It takes care of ground that conventional equipment can't reach.



Multi-fuel engine. Name almost any propellant, and this experimental truck diesel runs on it—efficiently, too. A modified Mercedes-Benz, it uses diesel fuel, gasoline, jet fuels, kerosene, lubricating oil, a combination of two or more, or it can be switched from one to another depending on what your tank or tanks hold. Main changes in engine design are a new injection pump and higher compression for ignition of light fuels.

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World's largest propeller. The biggest ever installed on a ship, the giant propeller above is being lifted into place on the new 60,000-ton supertanker Sansinena at the Newport News (Va.) Shipbuilding yards. It weighs 73,000 pounds, is 24 feet in diameter and will push the huge vessel at better than 17 knots. The big tanker, launched late last summer, will operate between the West Coast and the Persian Gulf.

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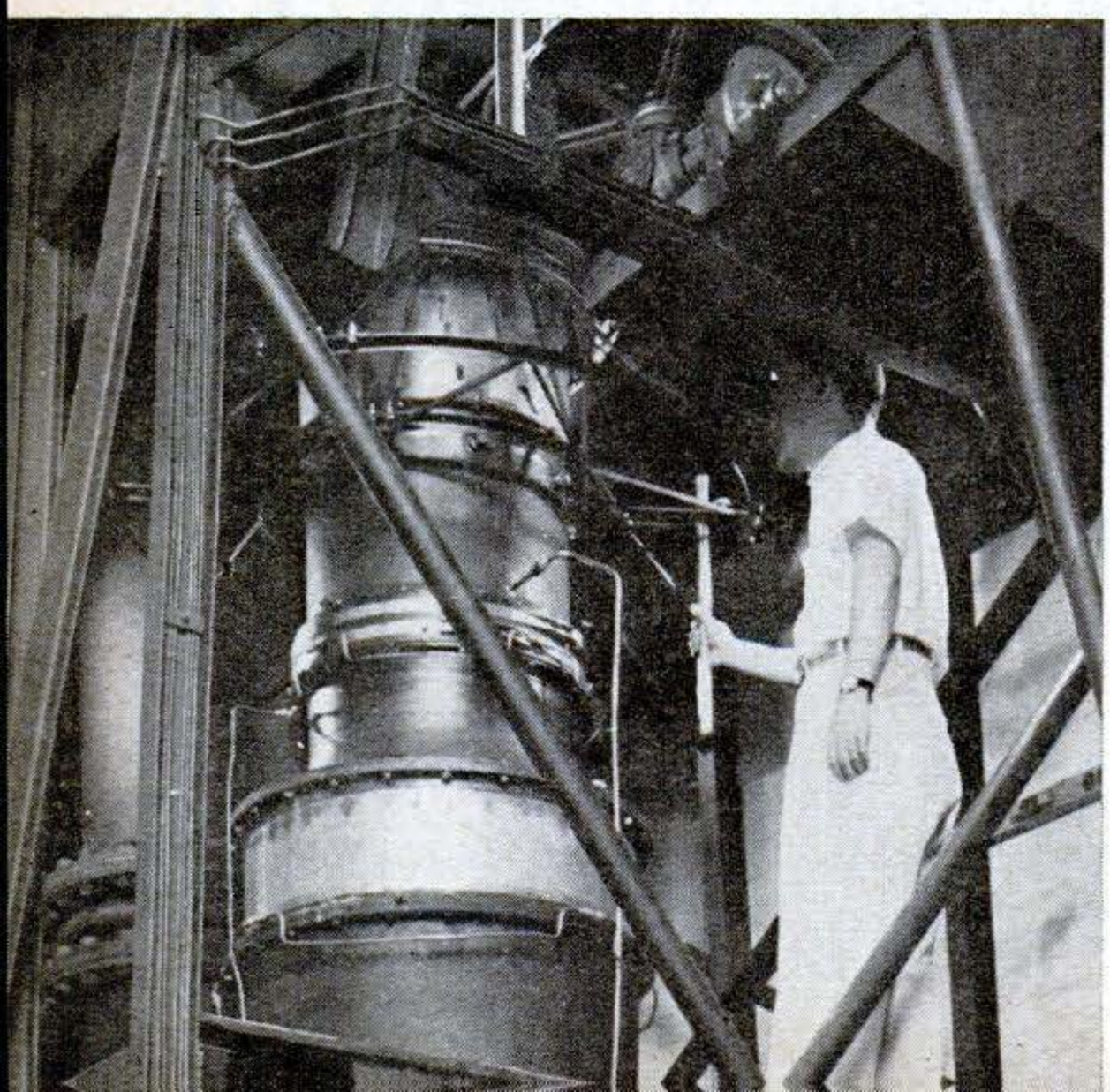

Water tunnel. These patterns are formed by 8,000 gallons of water a minute passing a steel sphere in a water tunnel. The new tunnel is used at Westinghouse Research Labs for studies of flow patterns made past steam-turbine and jet-engine rotor blades and other equipment.

The tunnel, shown at left, weighs 21 tons and holds 13 tons of rapidly moving water. It serves essentially the same purpose as a wind tunnel, but is much more compact. Engineers say it provides better opportunity for studying complicated or highly turbulent flows past both moving and stationary structures.

Photographs like that above are made possible by air bubbles, tiny drops of oil or bits of plastic suspended in the fluid.

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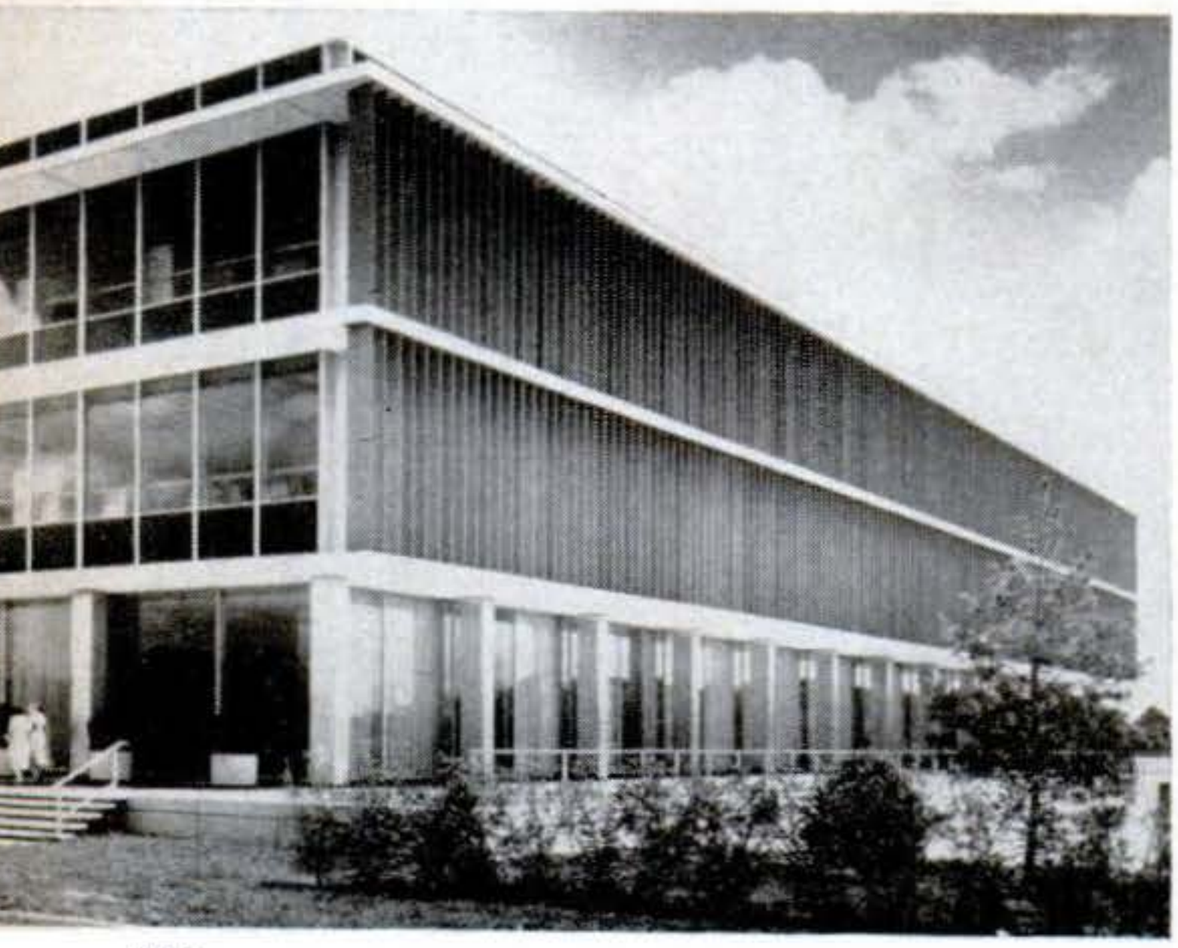
Bedside controls. When this patient at Chicago's Wesley Memorial Hospital hangs up her one-piece phone [PS, Dec. '56] she has her needs at her fingertips. The panel designed by Minneapolis-Honeywell controls temperature, adjusts bed height, puts lights on or out, operates closed-circuit TV, tunes in the radio or lets her talk to the nurse's desk.

Power pack for airliner. Turboprop power on this military version of the familiar piston-engine Convair passenger airliner triples its rate of climb, which lessens the noise nuisance for residential areas around airports. Speed is upped from 270 to 350 m.p.h. Allison, a division of General Motors, is offering airlines a conversion job.



Louvered building. The largest Venetian-blind system in the world, a total of 880 of these giant aluminum louvers move automatically with the sun to protect the east and west faces of Reynolds Metals Co.'s new general office building at Richmond, Va. Each louver is 14 feet high and 22 inches wide.

The system is operated by two 7½-hp. and two five-hp. motors which change the position of the louvers several times a day, rotating them slightly in advance of the sun's movement. Timing corrections for seasonal changes are made automatically by a master clock that will keep the controls adjusted until about 2100 A.D.

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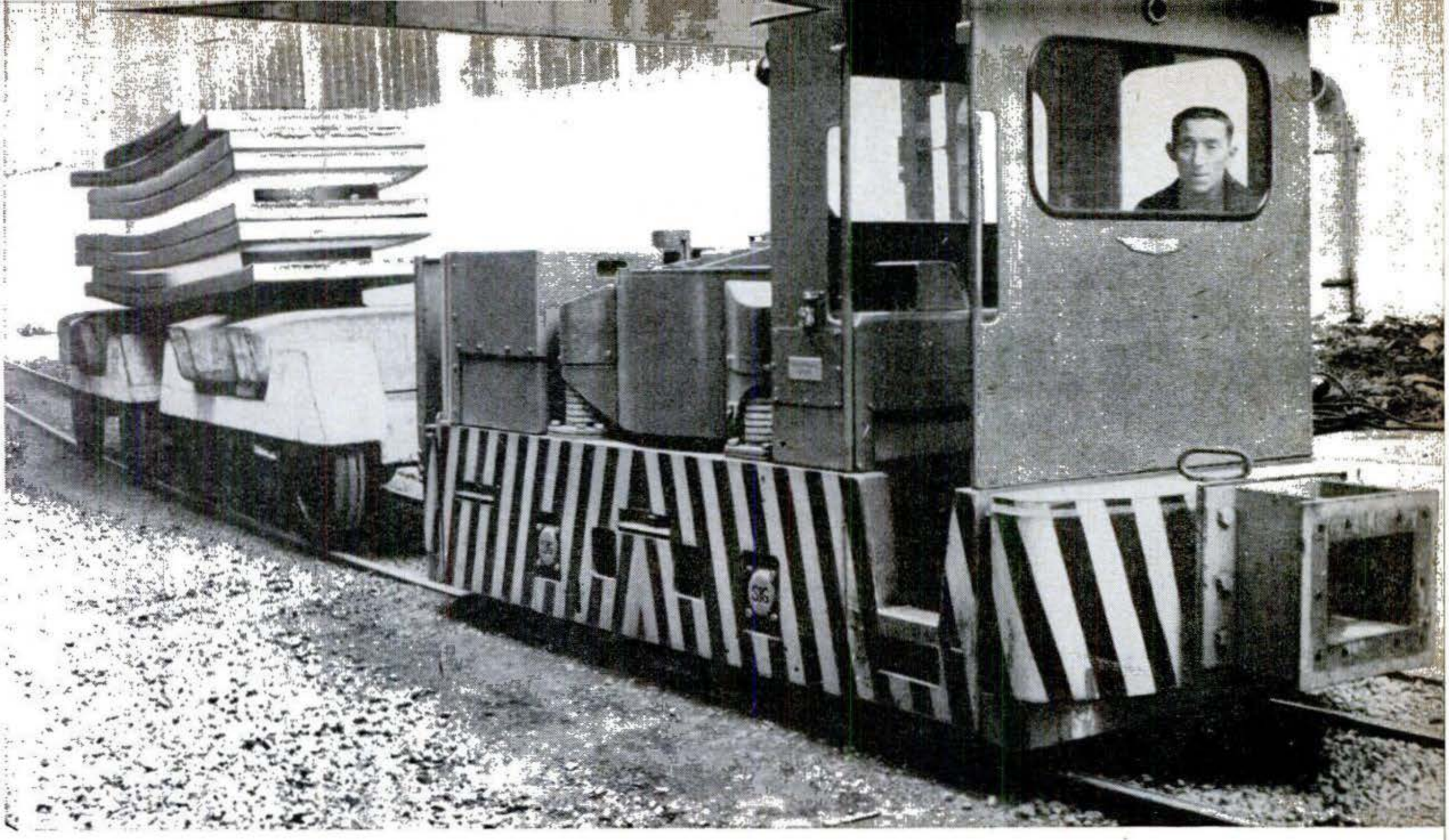
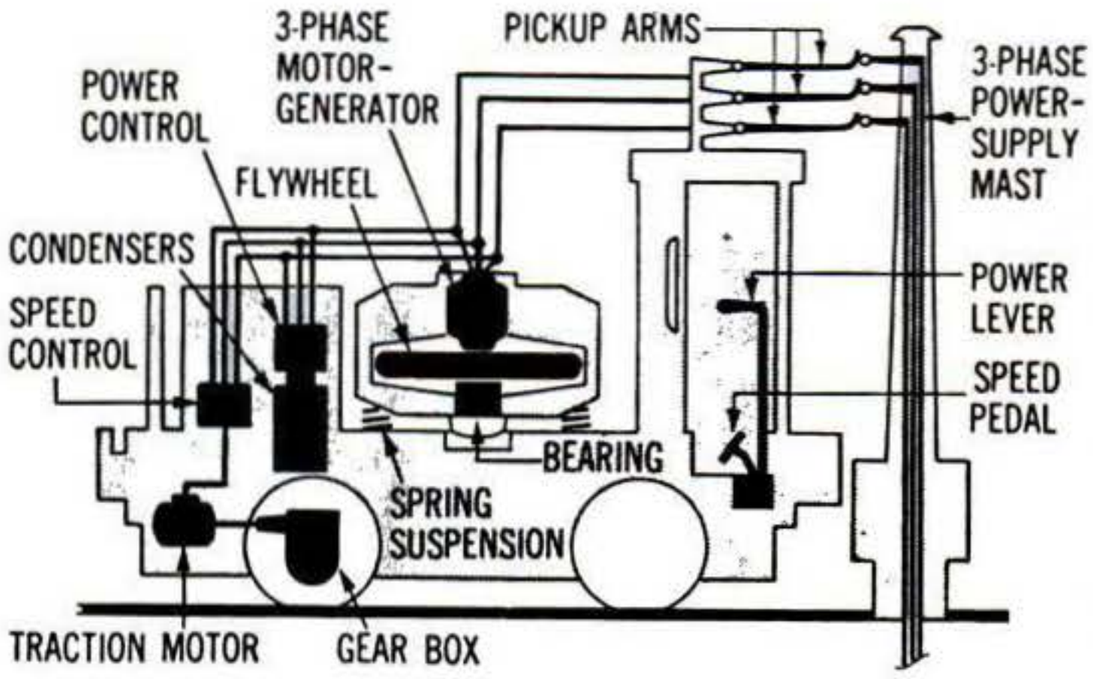
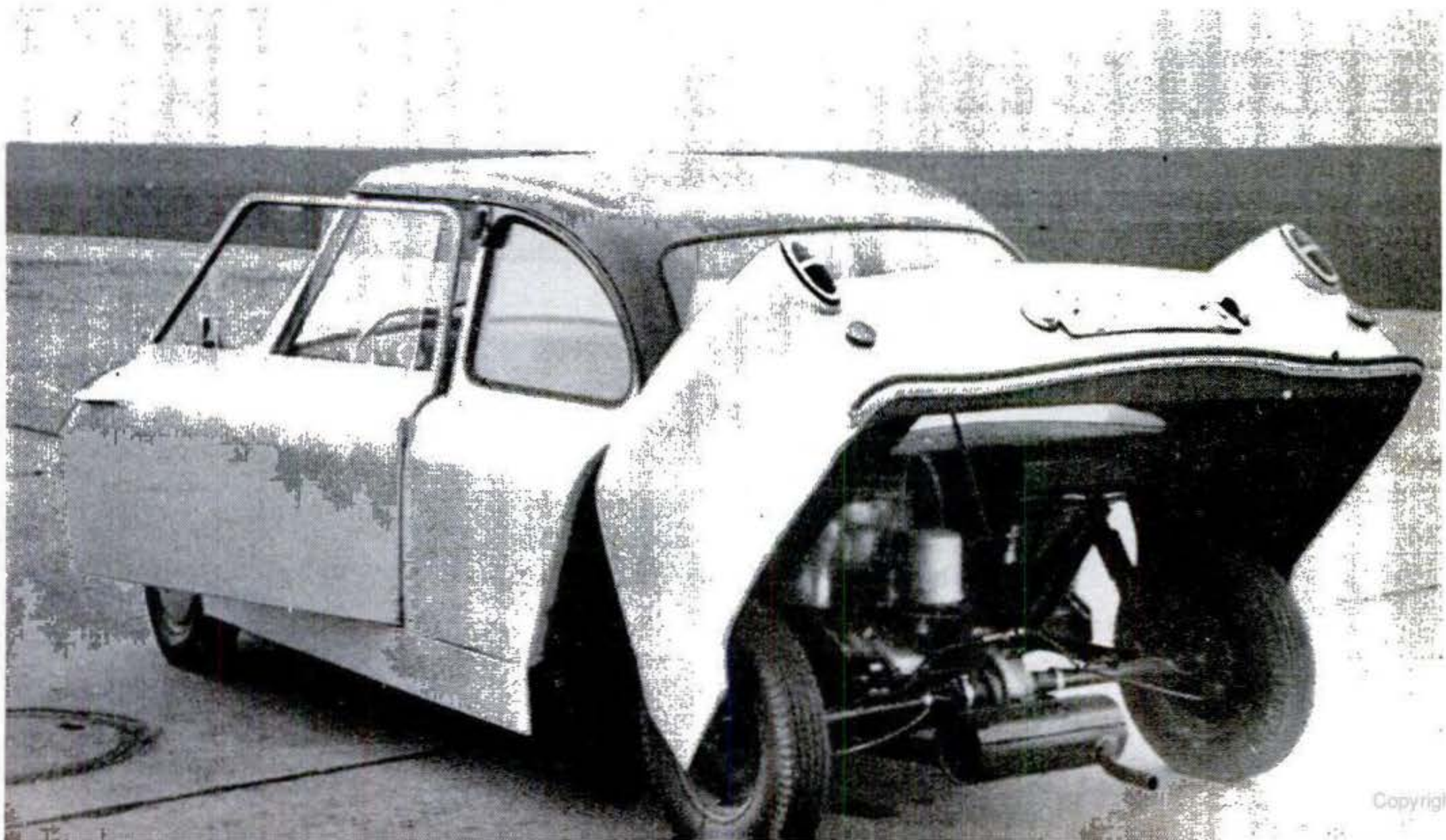




Flywheel - driven engine. This gyro-electric locomotive needs no overhead trolley. It is driven by a flywheel that turns a generator to supply current, as in the drawing at left.

At stops five miles apart, overhead pickup arms connect with conductors to renew the charge. The generator then acts as a motor to reaccelerate the flywheel. The locomotive is built by Oerlikon of Zurich for Swiss mines and steelworks.

Hinged rear makes engine tuning easy. The entire rear deck of this new four-passenger Messerschmitt swings up for access to the motor. The little car was designed in Germany but will be manufactured only in the United States where it is expected to sell for $1,000.



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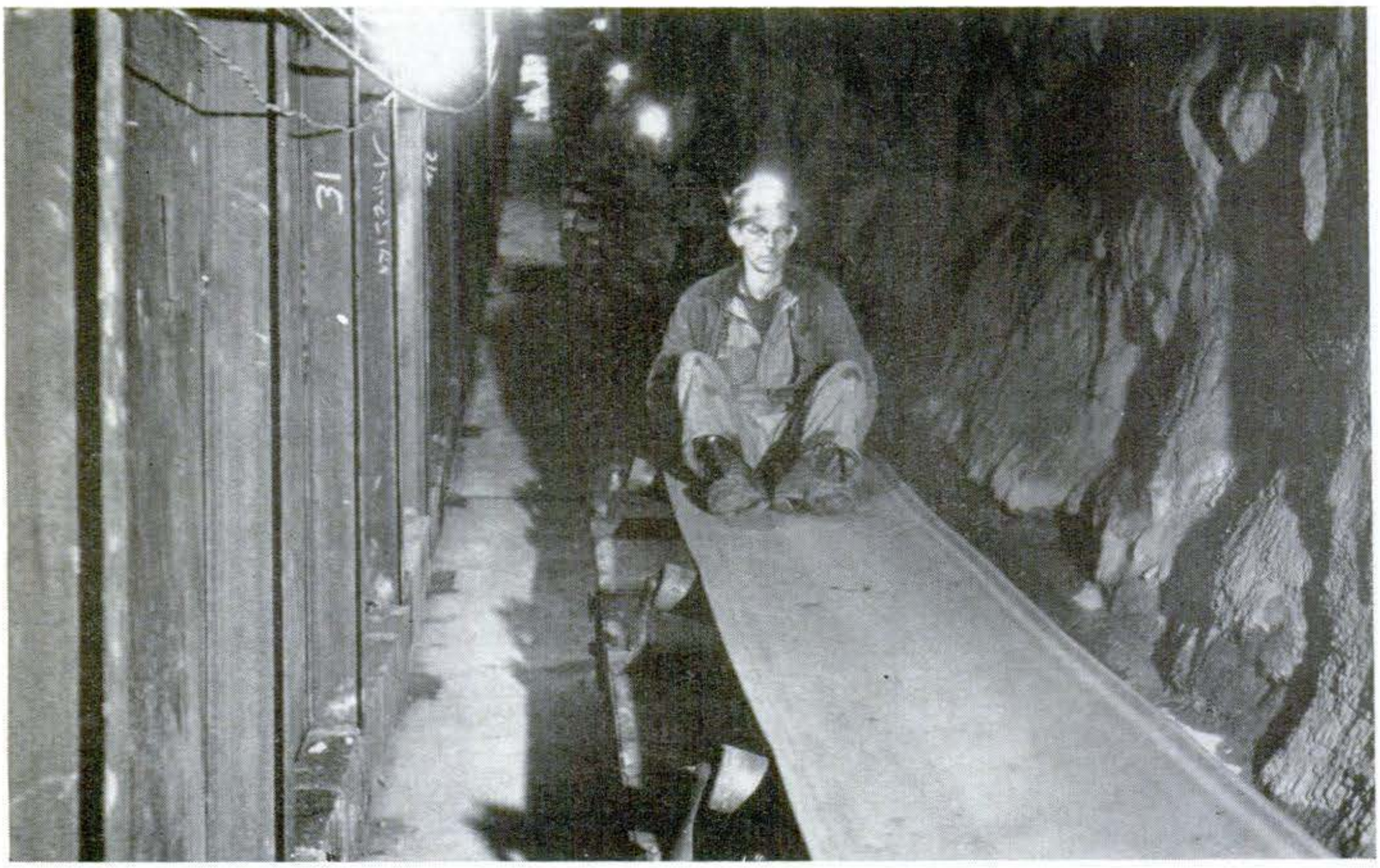
Motorized hunters. When Hal Blalock of Orange Park, Fla., takes a hunting trip, he can do off-road traveling while riding the hood of his modified, four-wheel-drive pickup truck. Both driver and passenger get a clear shot when game is flushed. Hunting dogs are transported in kennels in the truck body, which also carries a bed, stove and icebox.

Man-carrying conveyor belt. Instead of using an elevator, these West Virginia coal miners get to and from work on this Manveyor designed by Hewitt-Robins. It's quicker, too. Riding a 20-degree slope at 150 feet a minute, it moves the men at a rate of one every six seconds.



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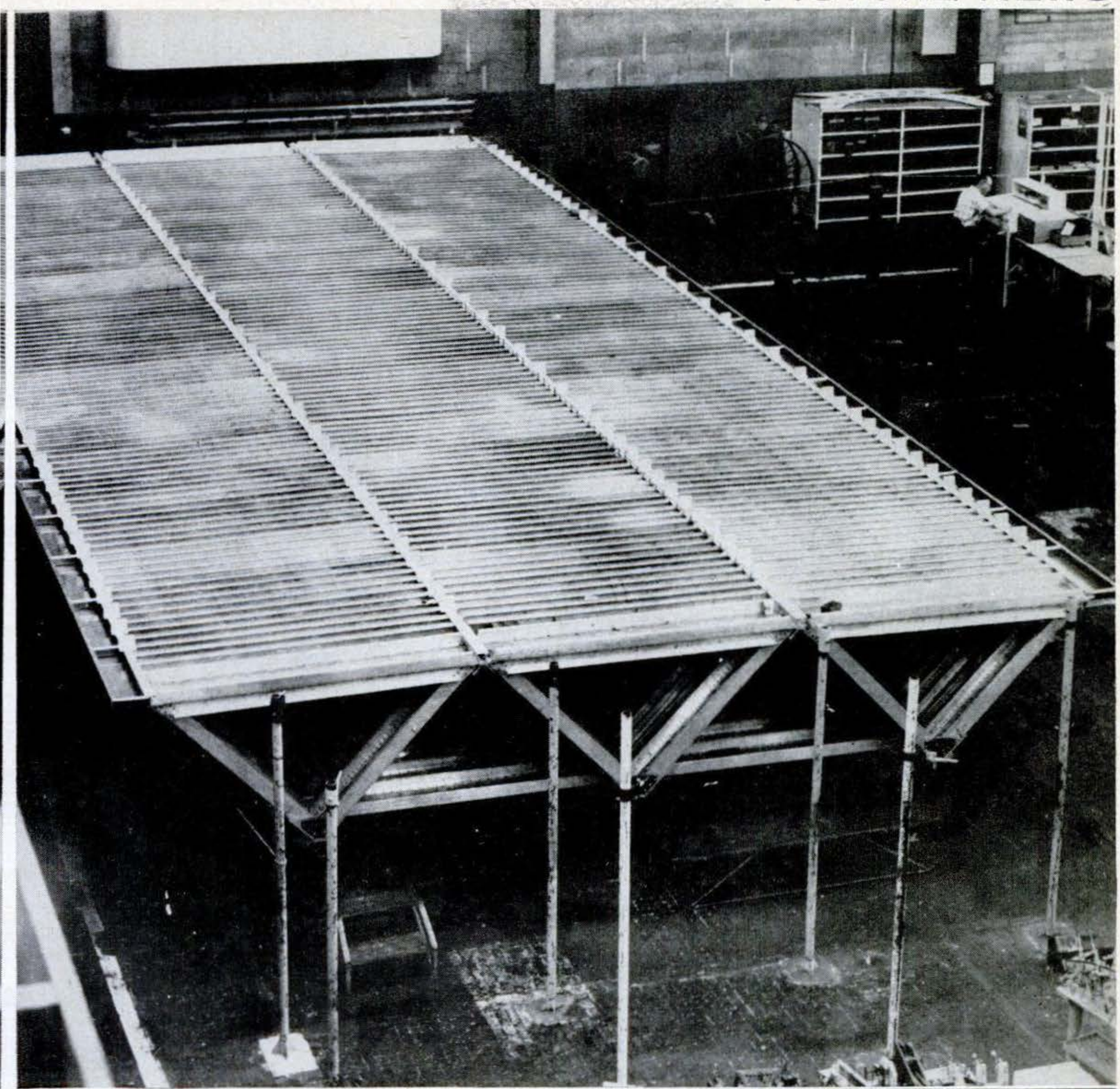

Aluminum bridge. Designed for mass production, this aluminum highway span has a stressed skin like a plane's fuselage. Its three triangular beams will support a two-lane concrete slab.

Fairchild Engine and Airplane Co. designed and built a 50-foot section, then shipped it by truck to Lehigh University's engineering laboratory for reassembly and testing by federal engineers—the first time a highway bridge ever underwent service tests before installation.

At right, a workman reflected in the shining sides is shown bolting a beam together in a preliminary assembly. Five of them built the section in two days.

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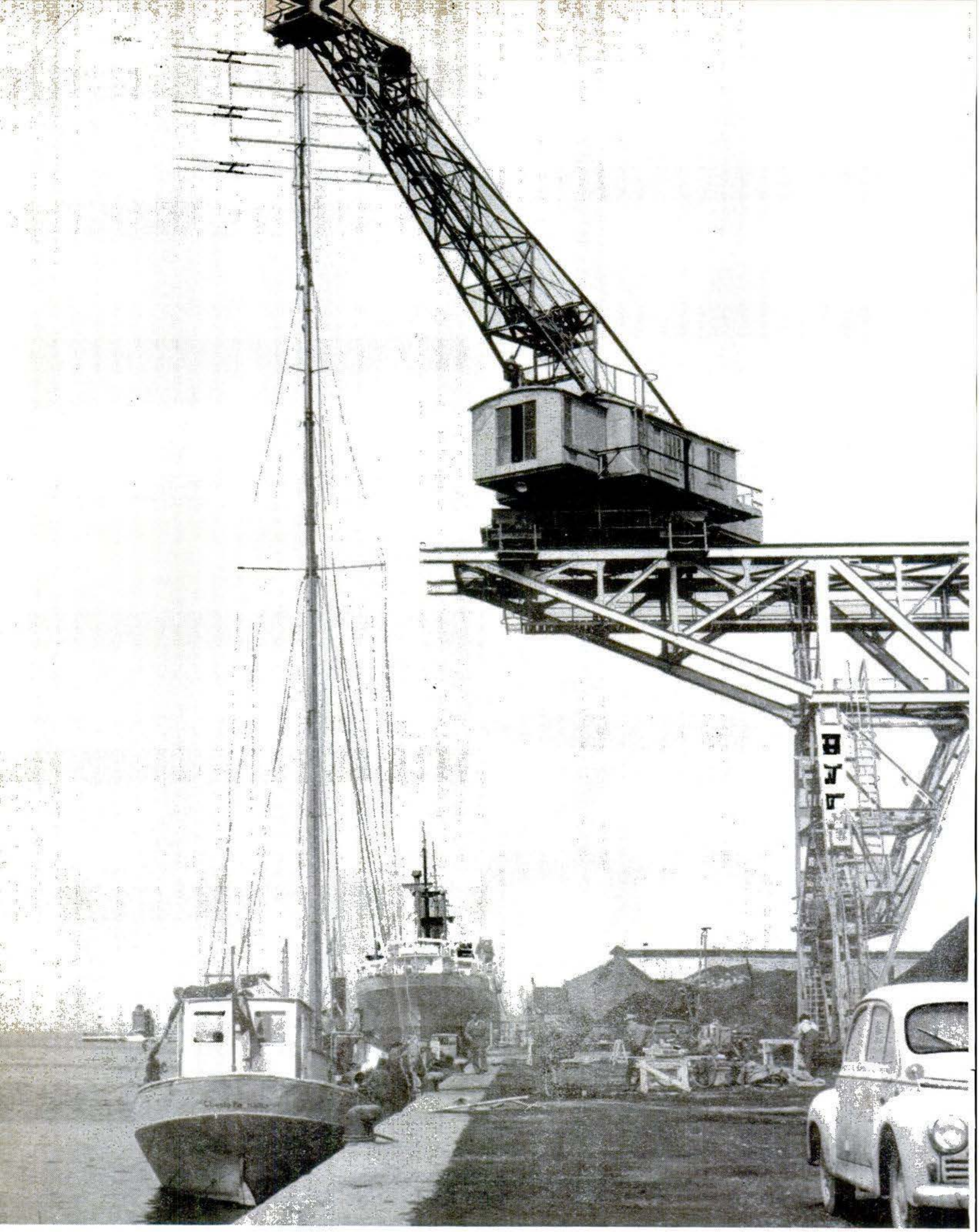

Pirating the air waves. Being fitted at Lindhamn, Sweden, with a towering broadcasting antenna, the Cheeta, of Panamanian registry, will ply the neutral waters of Oresund, the sound between Sweden and Denmark, to broadcast commercial programs in competition with state stations. It will use tapes from the first advertising radio studio in Scandinavia.

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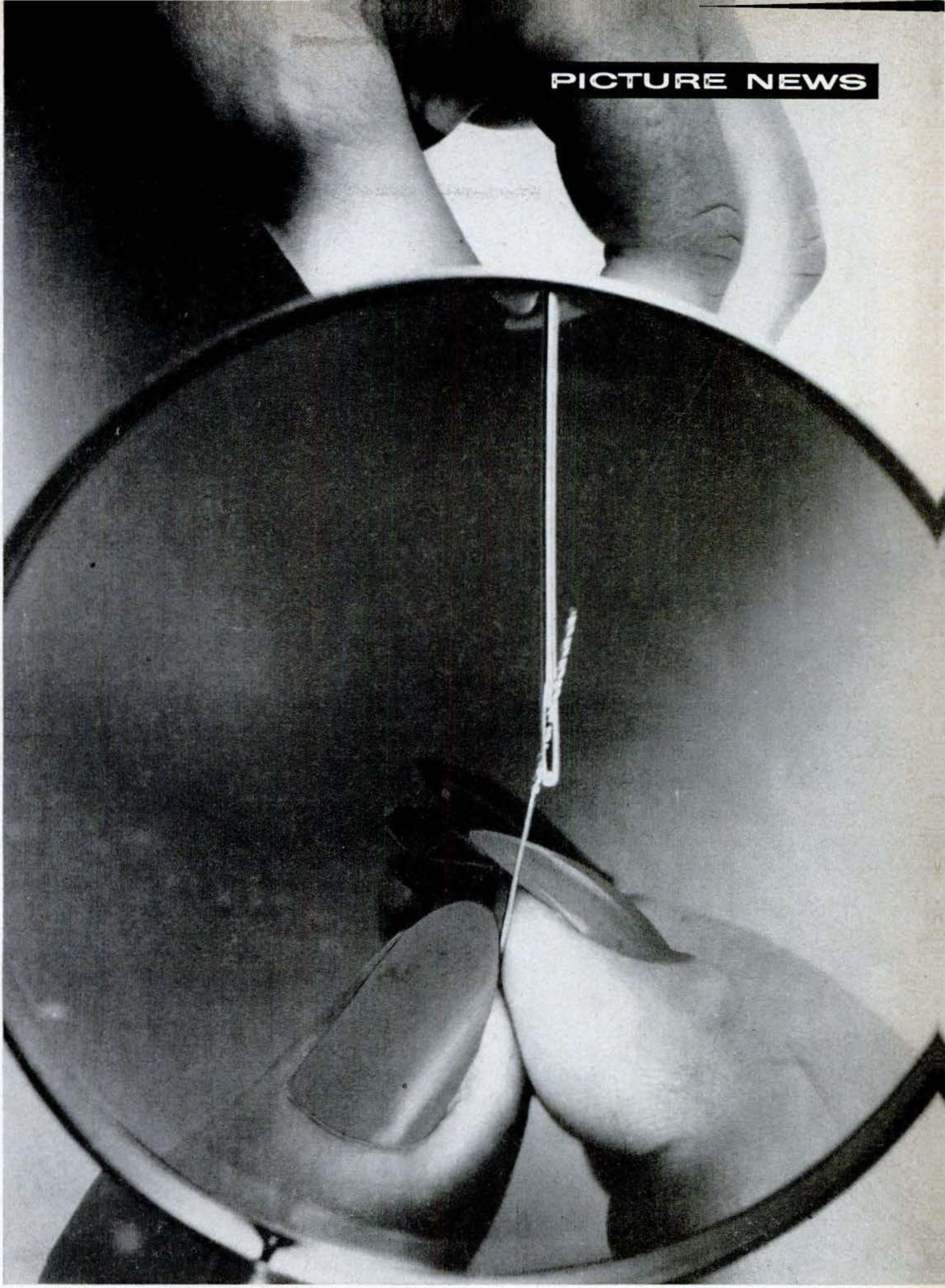

Drill fits needle's eye. This .024-inch-diameter precision drill being pushed here through the eye of an embroidery needle with room to spare is made of superhard cemented carbide. Super Tool Co. of Detroit produces the tough, tiny bits for drilling nonferrous and other materials used in rockets, missiles and aircraft instruments.

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Ox-powered generator. Bullocks in Khanpur, India, turn this generator connected to a high-efficiency water pump. It's geared to spin much faster than the oxen walk. Engineers say it can produce power to electrify an entire village and supply water to irrigate 100 acres.

Electric mirror de-ices itself. Pyrex rear-view mirrors coated on the back with a fused-metal electrical conductor will melt encrusted ice at the turn of a switch. Made by Corning Glass Works, they are expected to be available for trucks this winter, for passenger cars somewhat later.

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Big noise. Compressed air forced through this twin-horn speaker makes a noise 10,000 times louder than heavy street traffic. RCA uses the device to gauge the effect of high-intensity sound on electronic gear in jets and missiles. Earmuffed technician is removing a radio after test.

First propjet private plane. This 10-passenger Grumman Gulfstream (19 passengers with more compact seating) is the first turboprop built in the United States for business flying. Its top cruising speed is 370 m.p.h. at 25,000 feet with two Rolls Royce Dart turbine engines.

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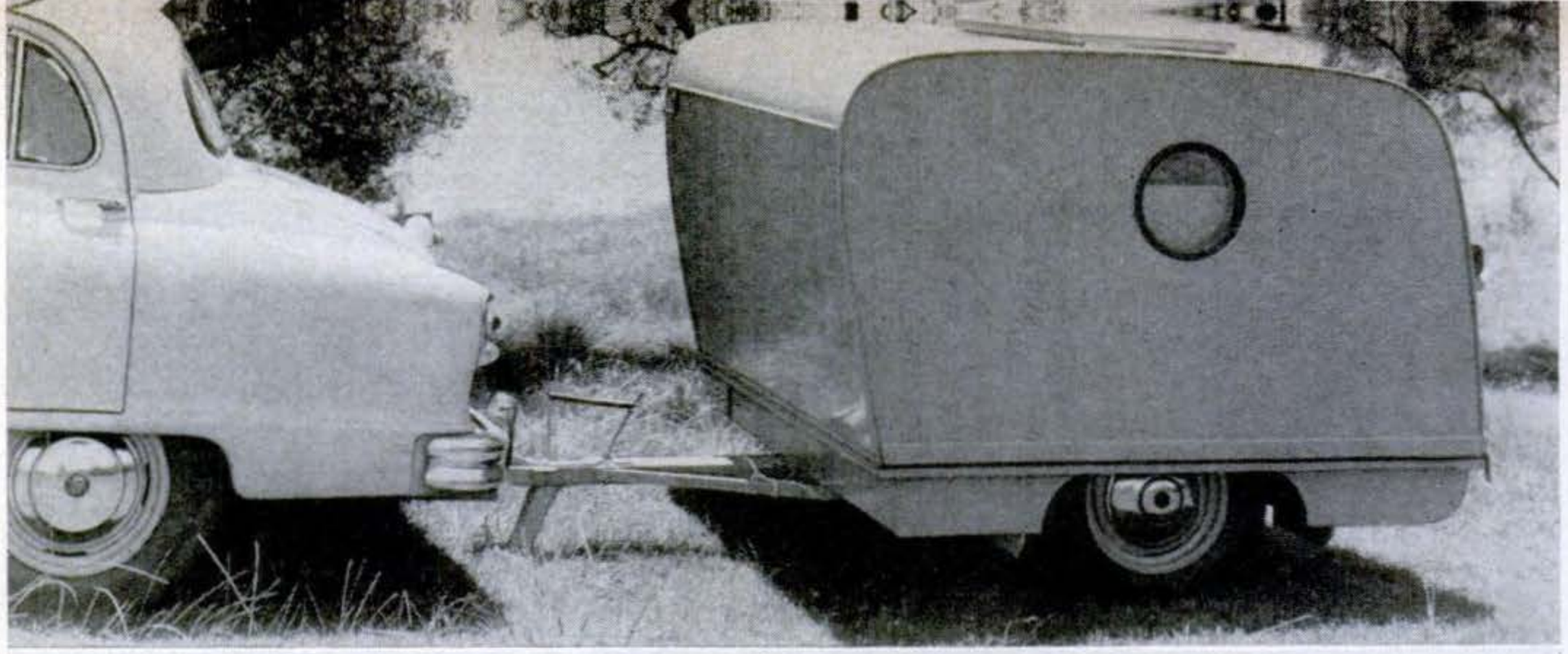
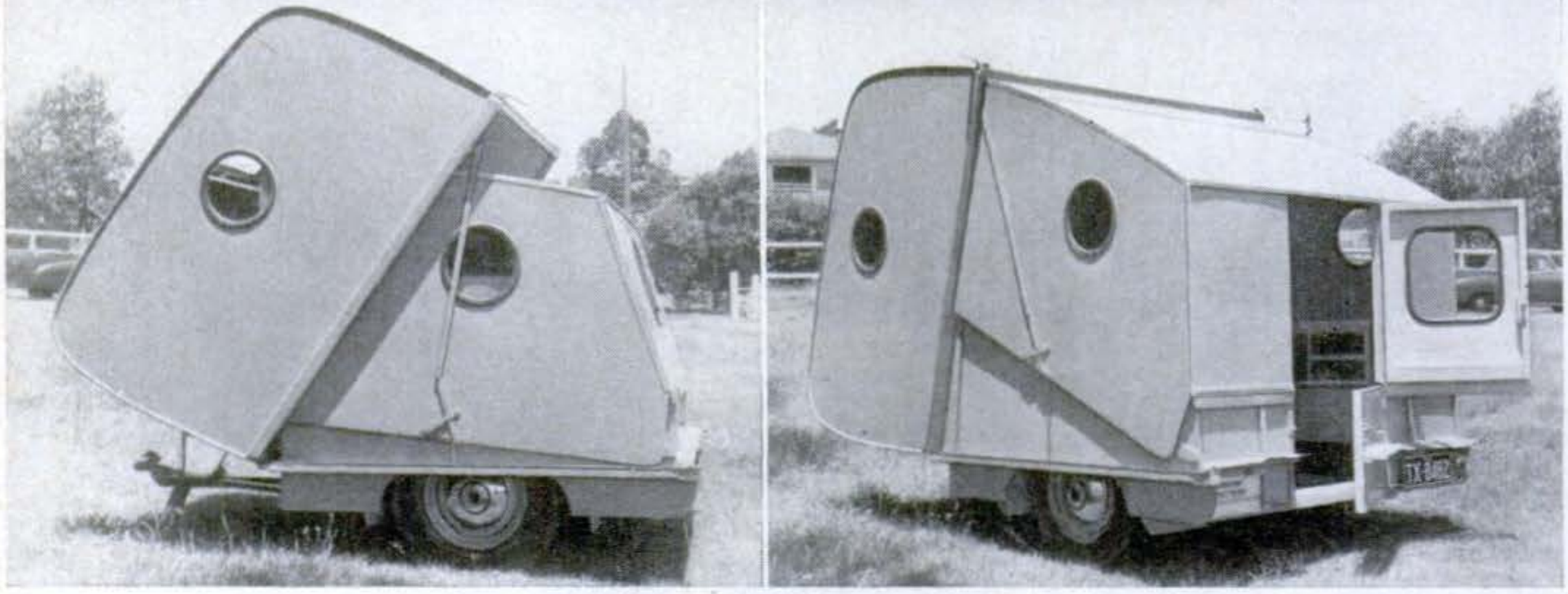
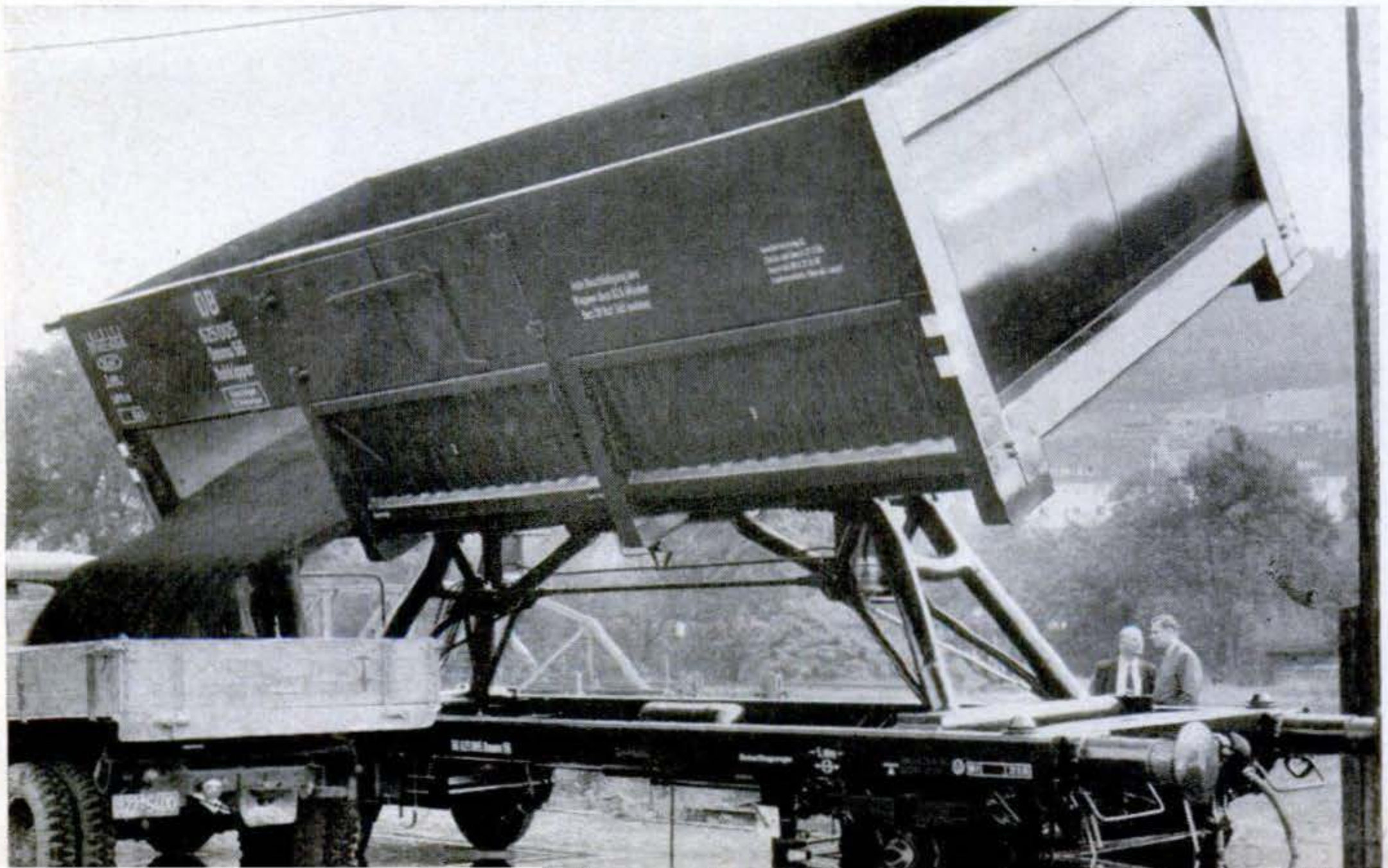




Folding trailer opens like jackknife. This Australian mobile home rides in a compact six-foot-square size 5¼ feet high, but at the camping site it expands to a nine-foot length with a comfortable 6¼ feet of headroom. It's made—with built-in furniture—in three nesting shells hinged and counterbalanced to open or close with one movement.

Tilting gondola grows stilts. Delivery of coal and other bulk freight on German railroads is greatly speeded with the use of this new gondola car which not only tips for dumping to either side but can be raised by an electric motor to a height of five feet, three inches to clear receiving trucks. Workers say it saves 90 percent in handling time.



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Marine skydiver. Here's a member of a new team of Marine specialists being trained at Camp Pendleton, Cal., to make pinpoint landings from high-speed planes behind enemy lines. The men drift through the air, using arms and legs to guide them toward an exact location before opening their parachutes. It is similar to maneuvers of French paratroopers in controlled free fall introduced a year or so ago (PS, June '57).

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NEW DRUGS TO TUNE UP

BY GEORGE R. PRICE

Medical science now holds forth the promise as newly discovered chemicals enable

AN EXCITING new idea is taking shape in medical science: the idea that the goal of medicine is not just to prevent or cure disease but to raise every person to the highest possible mental and physical vigor and well-being.

Some people are born exceptionally fortunate in brain and body. There are the natural athletes, the child prodigies, the ones who never get sick, the people with tremendous drive and energy, and those who are strong and active in old age—like King Masinissa of ancient Numidia, whose 44th son was born when he was 86 and who at 90 could mount his horse unassisted and ride bareback. Until a year or so ago it looked as if the average person, not so fortunate in his ancestors, could only be envious. Then all at once a startling view of new possibilities was opened up by discoveries about the amazing drug iproniazid (trade name: Marsilid).

Marsilid—sometimes imprecisely described as a "pep pill"—is considered to be the first of a new class of drugs, the psychic energizers, opposite of the tranquilizers. Twice it has made newspaper headlines in the seven years since it was first synthesized by Dr. H. H. Fox, organic chemist at Hoffmann-La Roche, Inc., of Nutley, N.J. In 1952 it was being tested for tuberculosis treatment, and pictures were published showing patients dancing in the wards. Then last April bold type read: "Pep Pills Blamed in 20 Deaths."

 No. 4 in a series of articles exploring the frontiers of science

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OUR BRAINS

of a fuller, richer life for everyone—
us to perform at peak efficiency all the time

The sensational impression was that here was something wild and abnormal—a bigger "kick" than Benzedrine, more unhealthy than heroin. But the newspapers missed the really significant story. *The* most important thing about Marsilid is not what it does itself, but what it shows will be possible for the better drugs that are certain to follow. And the startling part of the picture is not the abnormal effects, but just the opposite; with most patients the effects are surprisingly natural and normal.

For example, when someone is "high" on marijuana, cocaine or alcohol, he acts odd and the pleasure he feels is a false, excited pleasure called euphoria. But when a patient takes Marsilid, the typical comment from his family is "Doctor, he's himself again!"

The most striking effect of Marsilid is that people taking it have amazing drive and energy and can often get along on four or five hours of sleep a night. But unlike ordinary stimulants such as ephedrine, caffeine (in coffee), Benzedrine and Dexedrine, there's no letdown afterwards. A man who takes Benzedrine can keep going at high pitch for a couple of days, but after he loses too much sleep, he deteriorates. He's awake, but he looks awful, he feels awful, his blood pressure is up, his appetite is gone, his heart is beating rapidly, he's too excited to sleep, his mind isn't working clearly.

With Marsilid, a man feels well, looks well, eats well and thinks

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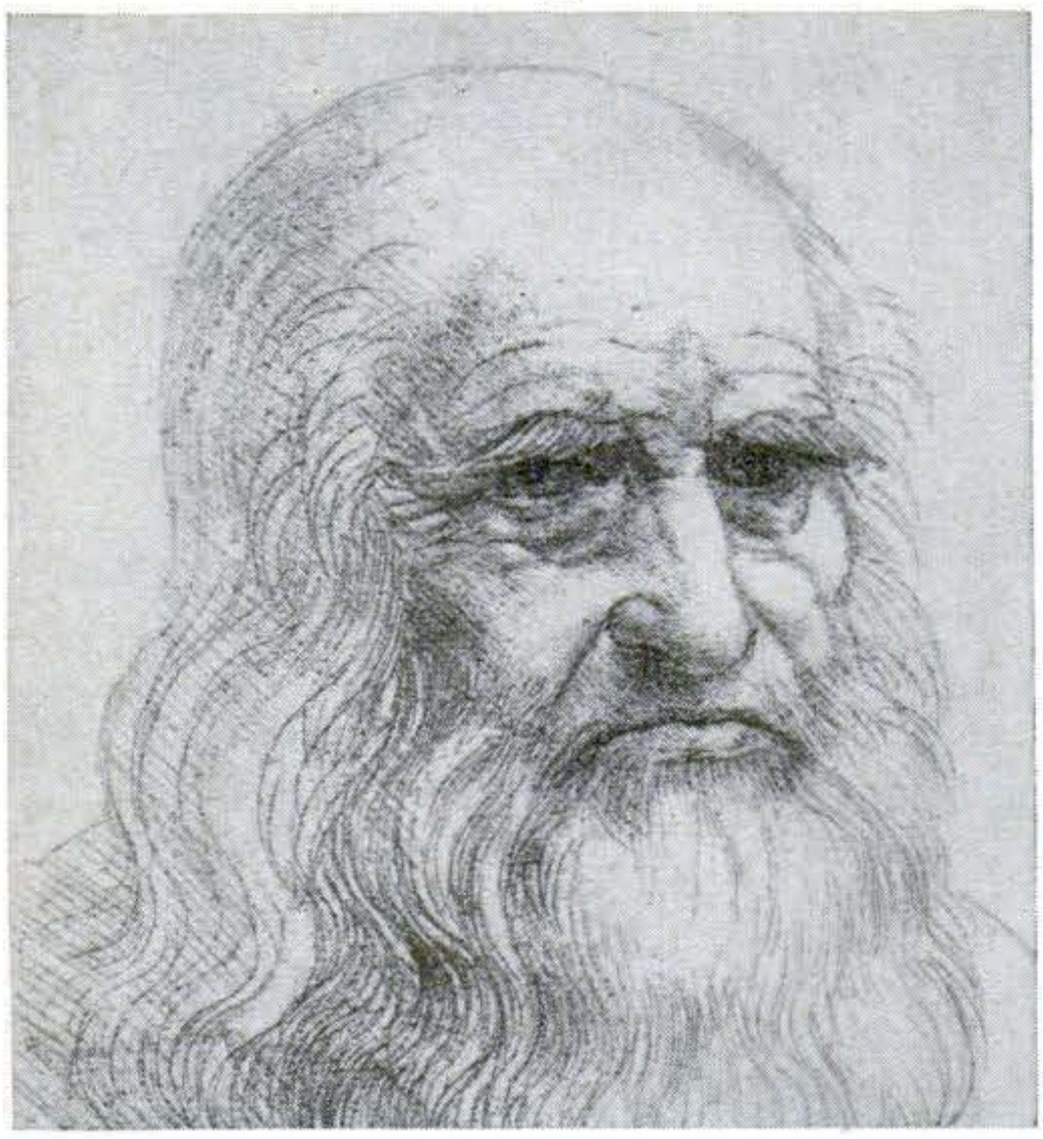
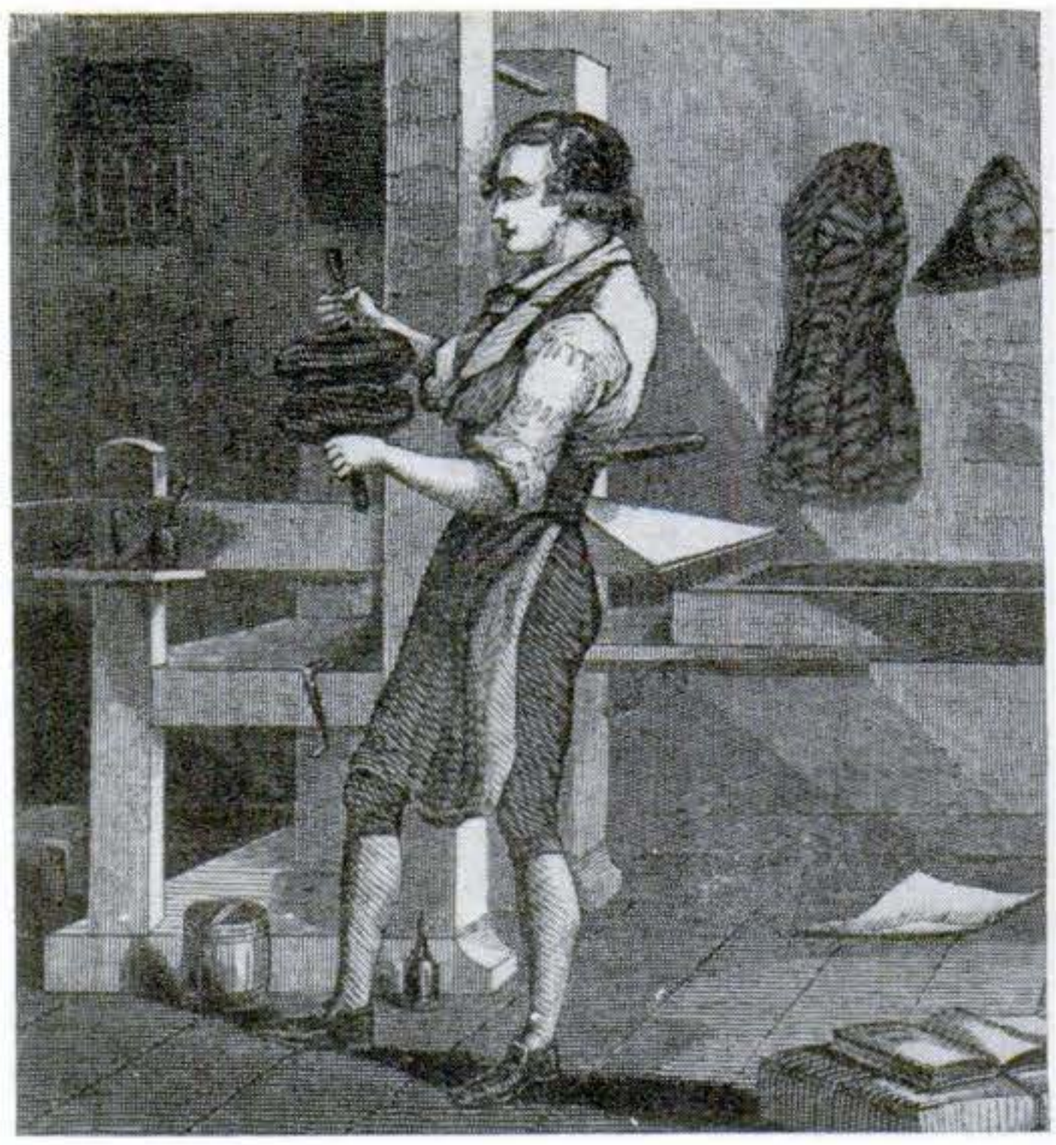
Will future drugs endow many of us with the phenomenal energy



Leonardo DaVinci: The great Florentine painter was also a brilliant engineer and architect—and a scientist hundreds of years ahead of his time. He built bridges, canals, cathedrals; pioneered in hydraulics, meteorology, anatomy; foresaw human flight.



Benjamin Franklin: Starting as a poor printer, he became a towering figure in early America. His mind ranged over a multitude of interests: electricity, natural history, medicine, mathematics, a new kind of stove, street lighting, earthquakes, public libraries.

clearly; his blood pressure is down instead of up, the short hours of sleep are sound and satisfying.

Dr. Nathan S. Kline, New York psychiatrist who is probably the No. 1 authority on the psychological effects of the drug, calls the Marsilid reaction "eudaemonia." This word was used by the Greek philosopher Aristotle to describe a feeling of healthy well-being—the happiness of an intelligent, active life.

Some people are this way naturally. Thomas Edison, for example, usually slept four to five hours a night, and when he was hot on the trail of an invention, he would work four or five days at a stretch, pausing only to grab a bite of food, or to catnap on a table. Napoleon had the same ability to go without sleep.

It is Dr. Kline's theory that the great, driving energy of such men is related to chemical conditions in their brains, to higher concentrations of some chemicals, lower concentrations of others than in the brain of the average man. And he suspects that what Marsilid does is to adjust concentrations of these compounds to bring chemical conditions closer to those in the brains of the higher-energy men. This would explain why the effects appear normal and natural: Many of them *are* normal and occur naturally in some people.

However, Marsilid is far from being a perfect drug to turn everybody into a Thomas Edison. It does too many different things. Some are in the right direction, others in the wrong direction. What is needed are other drugs with only a few effects, that can be combined to create the best possible chemical conditions in the brain. Marsilid tells us that we can hope to find such drugs, and shows us that traits such as laziness may be mostly matters of chemistry rather than childhood training.

Before discussing future possibilities, let's take a quick look at some facts about Marsilid.

What is Marsilid? It's a white powder with the chemical name 1-isonicotinyl-2-isopropylhydrazine. It's sold—on prescription only—in small pink (10-milligram), orange (25-mg), or yellow (50-mg) tablets.

What is it used for now? Primarily for treating depressed mental conditions. Hoffmann—La Roche also recommends it

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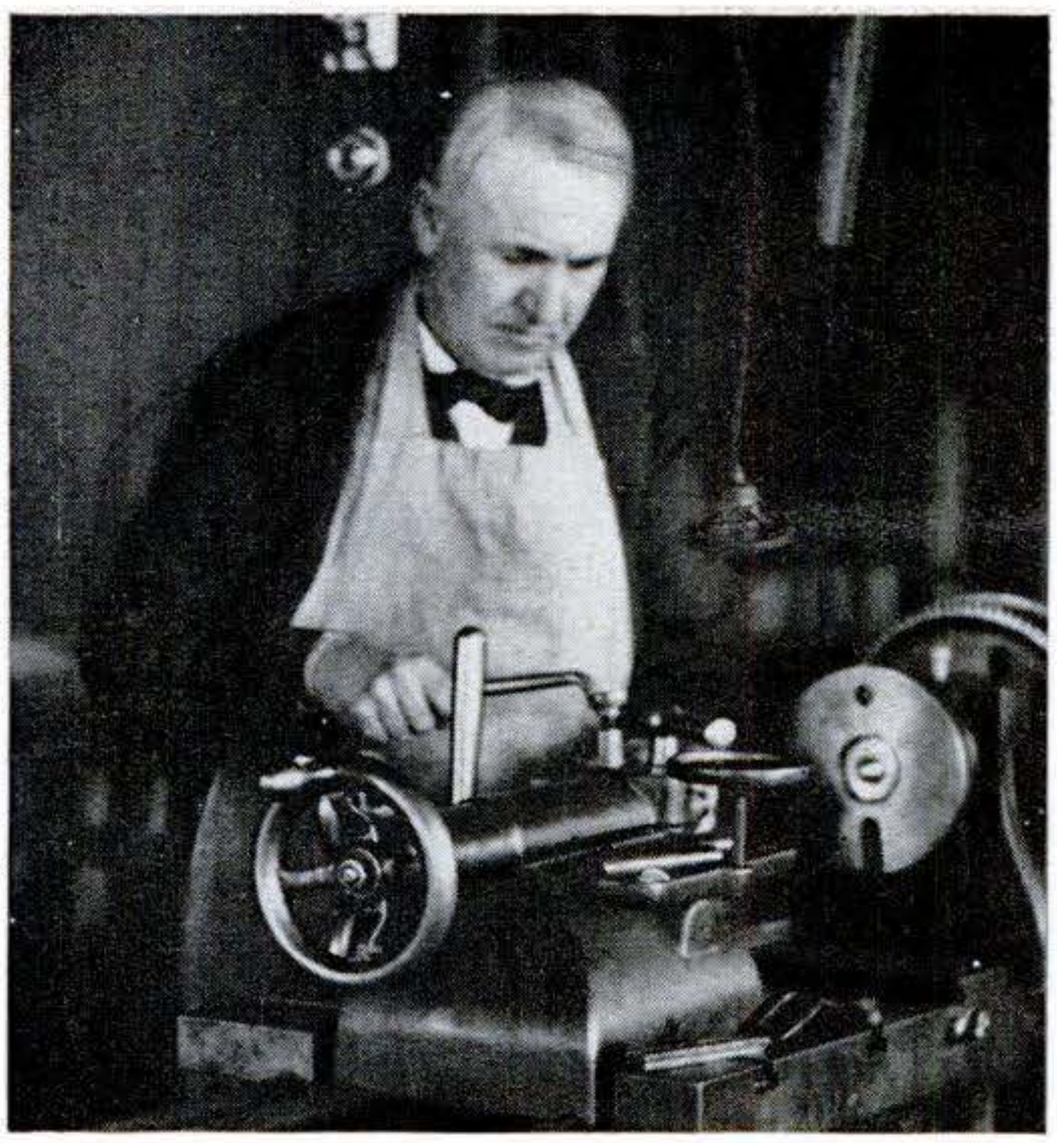
that made possible the careers of these human dynamos?



Thomas A. Edison: His astonishing vigor enabled him to work often around the clock. His inventions include the incandescent lamp, movies (and later talkies), telephone transmitter, mimeograph machine, dictating machine, phonograph and microphone.

Winston Churchill: Statesman, author, soldier, orator, Churchill has made history—and recorded it in some of the most powerful language since Shakespeare. In World War II his iron determination forged England's will-to-resist into a weapon of victory.

for stimulating wound healing, comforting patients dying of cancer, as an aid in treatment of arthritis, and to stimulate appetite in very weak patients. Some doctors have also used it for treating high blood pressure, tuberculosis, skin diseases, pain in heart disease, and in connection with psychiatric treatment of alcoholics and narcotic addicts. It is usually given daily, takes from a few days to a few weeks to build up in effect, and as long to drop off after treatment is stopped.

How does it affect healthy people? In adults, moderate amounts increase energy, stimulate appetite, produce mild eudaemonia, and reduce need for sleep. (One doctor had a skinny secretary who was very conscientious and devoted to her job. At her request, he gave her some Marsilid. Her appetite picked up, her figure filled out, and the next thing he knew she had quit her job to get married.) On healthy children and animals it has almost no effect, though it does affect sick children and animals.

Are there bad effects? In a survey of 3,586 cases, undesirable side effects were reported. Complaints were: constipation (reported by 823); psychological effects such as insomnia, irritability and anxiety (in 112); undesirably low blood pressure (99); dizziness or light-headedness (64).

Does Marsilid cause liver disease? The deaths last April were from liver disease, with symptoms very similar to the virus infections known as infectious hepatitis and serum jaundice. The tentative belief: Marsilid has little effect in causing liver disease, but increases its severity in people infected by the virus, so that the death rate is increased.

How does Marsilid work? It interferes with an enzyme called monamine oxidase, found in the brain and other organs. This enzyme helps break down several different chemical compounds, including three very important in brain chemistry: adrenalin, noradrenalin and serotonin. When Marsilid inhibits monamine oxidase so that it cannot transform these compounds, they build up to higher concentrations in the brain, to give increased psychic energy. (This is the picture as seen today, but there is a great deal more to be learned.)

Surprisingly, Marsilid came very close to being forgotten after the first trials

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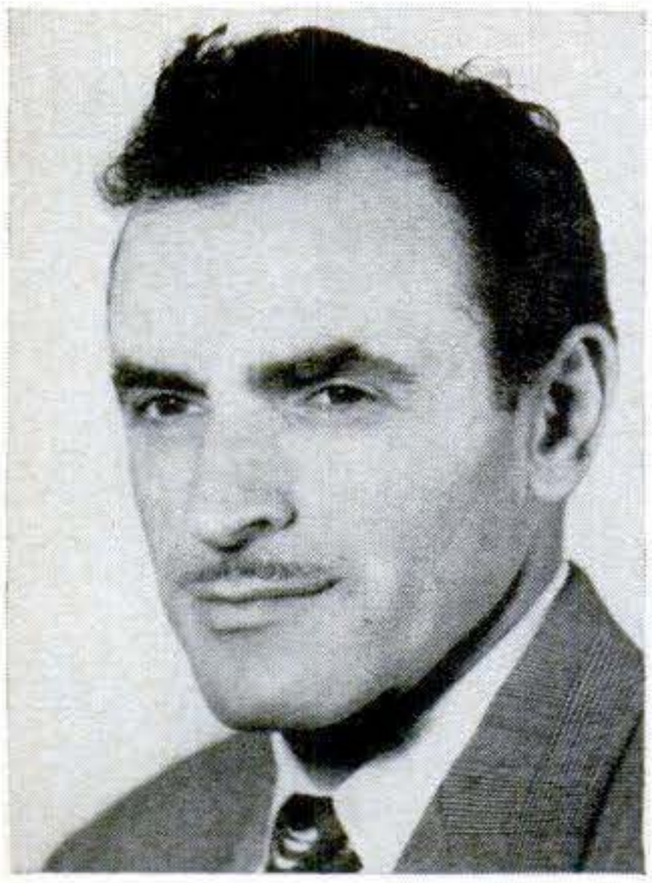
Three leading figures in the dramatic story of Marsilid



Dr. H. H. Fox discovered the new energizing drug.

Dr. David Bosworth kept alive interest in its use.

Dr. Nathan Kline demonstrated its psychiatric value.

on tuberculosis in 1952. It was replaced for lung t.b. by *iso*niazid, similar in formula to *ipro*niazid (Marsilid), which gave better results and didn't cause any dancing. During this period, interest in Marsilid was kept alive mainly through the efforts of Dr. David Bosworth, Director of Orthopedics at St. Luke's Hospital in New York.

Other pioneer investigators included Dr. Arthur Scherbel of Cleveland, who found Marsilid helpful in arthritis, and Dr. George Crane of New York, who tried it on different lung diseases. A few investigators tested it on mental patients, but they chose overexcited patients, for whom it was exactly the wrong thing, and so results were discouraging.

Thus not much was done with Marsilid until it suddenly came back with a bang on April 6, 1957, at a medical meeting in Syracuse, N.Y., when Dr. Harry Loomer, Dr. John Saunders and Dr. Kline reported on research at the huge Rockland State mental hospital at Orangeburg, N.Y. They had finally tested Marsilid on the right type of mental patient.

The results were dramatic. Silent, withdrawn patients of the "burnt-out" type, hospitalized for 20 years or more, had begun to come to life, talking for the first time in years, walking about, taking an interest in things.

Interest was enormous, and by a year later roughly a half-million patients had been treated with the drug.

Particularly interesting have been the results on patients not so severely ill as those at Rockland State. One private patient of Dr. Kline's was a miserably unhappy 30-year-old housewife, who after seven years of psychoanalysis was still so depressed that she spent 14 hours a day in bed. Today she has a new zest and joy in living. In addition to caring for her two children and running her household, she is taking a full course of graduate study; for more than a year she has been sleeping only three to three and a half hours a night, with no sign of needing more, and all this on a maintenance dose of one 10-milligram tablet a day.

Dr. Kline tried Marsilid on himself for a few weeks, and found that he could work much harder, faster and longer, and that his work was of higher quality.

At this point many readers may feel tempted to rush to their doctors and beg for a prescription. That's fine, of course, for those who are sick and really need the drug. But what about someone who, say, just wants it so he can go dancing every night till three a.m. and then put in a hard eight hours at work every day?

The best answer: Wait a while. Remember about the slow buildup and the side effects. It may take three weeks before the good effects appear, and three weeks after dosage is stopped to get rid of any bad effects. Furthermore, Marsilid is still very new, and extremely harmful effects may possibly appear a few years from now. Conceivably, it might

[Continued on page 250]

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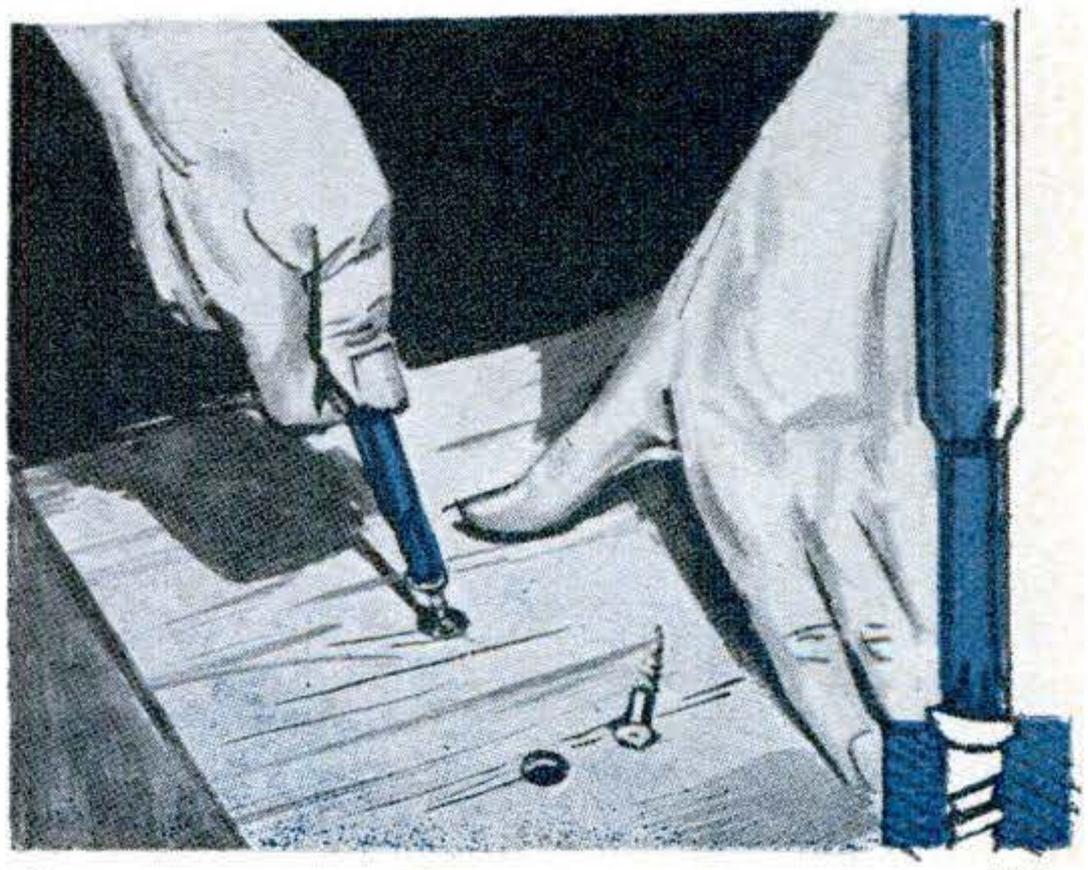
New Ideas from the Inventors

1 Portable Garage Shelters Car. You could cut the cost of building a garage —or of widening your present one for a second car—with the portable, space-saving shelter described in this recent patent. The light, counterbalanced hood could fit the car snugly since you wouldn't need space for passenger entry.

2 Closet Rack Spaces Hangers. Clothes would be less likely to get bunched or crushed if their hangers were spaced by the slots of this rack. Hooked over a regular closet bar, the rack could be shifted easily or lifted out as a unit for closet cleaning, or airing or packing clothes.

3 Driver Removes Damaged Screws. Instead of drilling out a small screw that has a stripped or sheared slot (and enlarging the hole in the process) you could use a tool like this to remove it the easy way. Hardened and pointed teeth would grip the damaged head for turning.



Please turn the page for more new ideas

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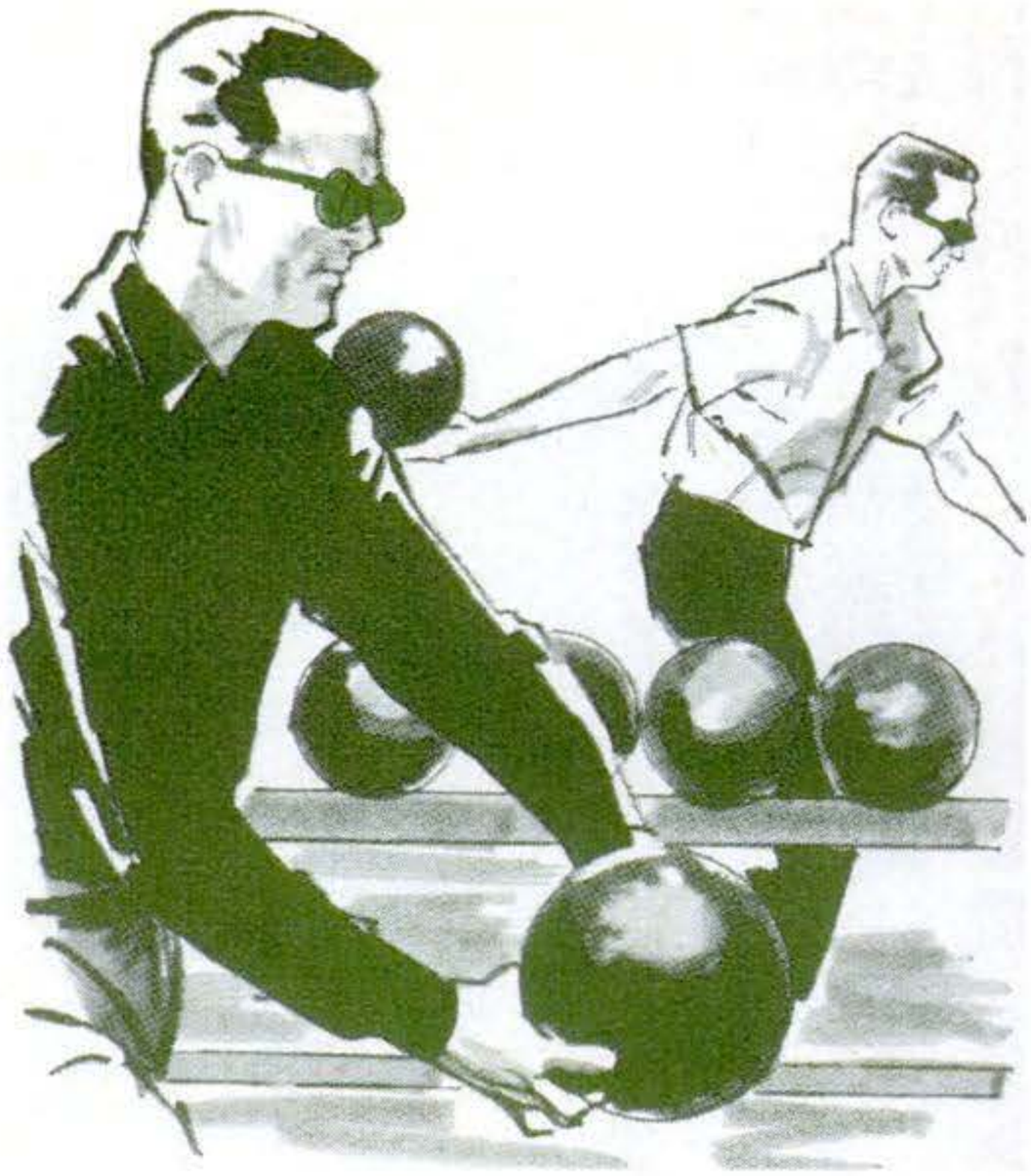
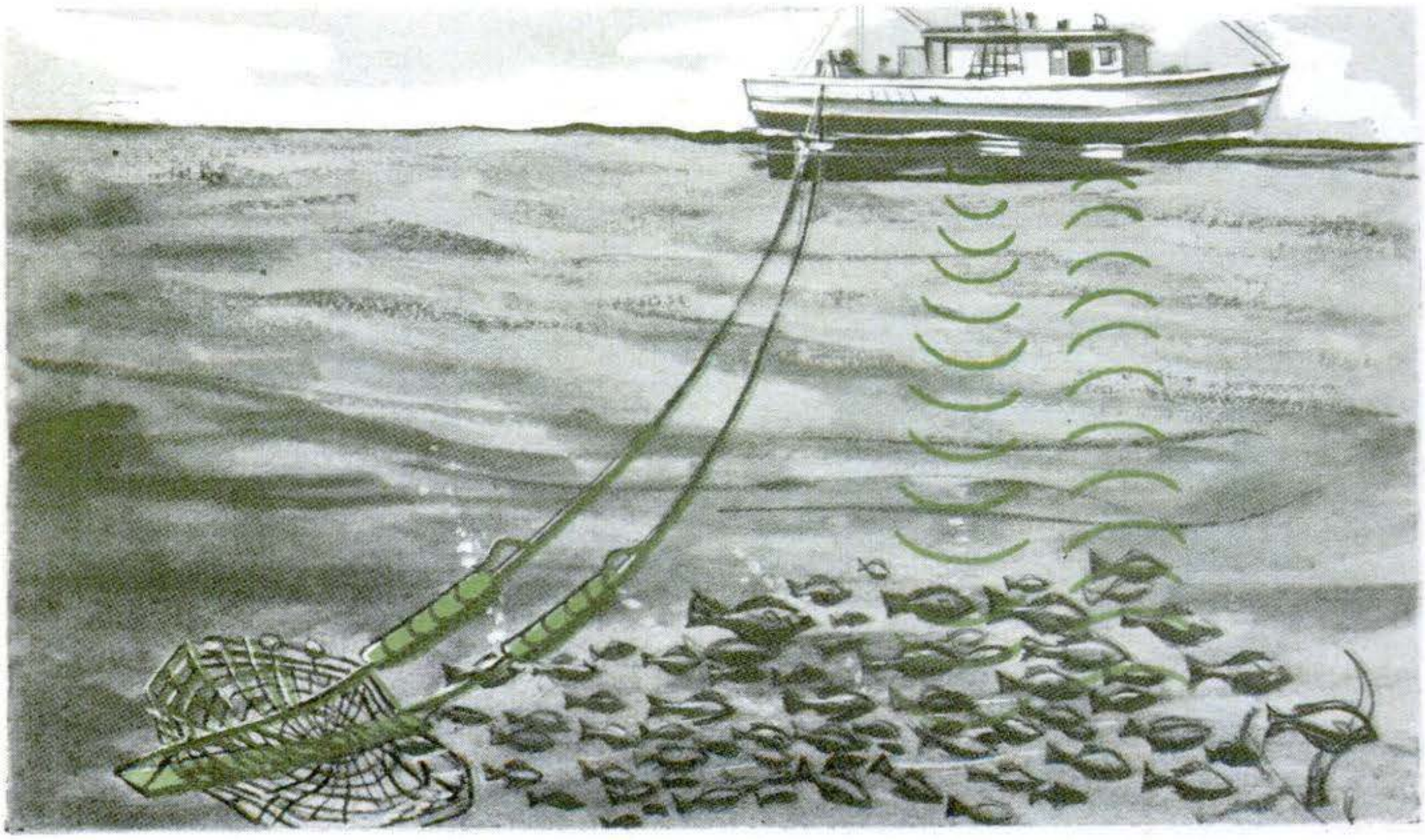


4 New Chessmen Battle for Space. To interest and train young players, this inventor would substitute modeled planets, computers, missiles, and similar space-age forms for the earthbound kings, queens, and other conventional figures of the world's oldest game of strategy.

5 Specs Keep Bowler's Eye on Ball. The movements of a bowler in the next alley wouldn't distract you (or alibi a missed spare) if you used blinders like these to limit side vision. The eye shields should also speed the game by allowing simultaneous play in adjoining alleys.

6 Hose Adjusts Fish-Net Depth. With water wings like these to vary the depth of their net at will, commercial fishermen might count on bigger hauls. They'd use a conventional echo sounder to locate shoals of fish, then pump air through hollow drag lines to regulate the buoyancy—and towing level—of the net.



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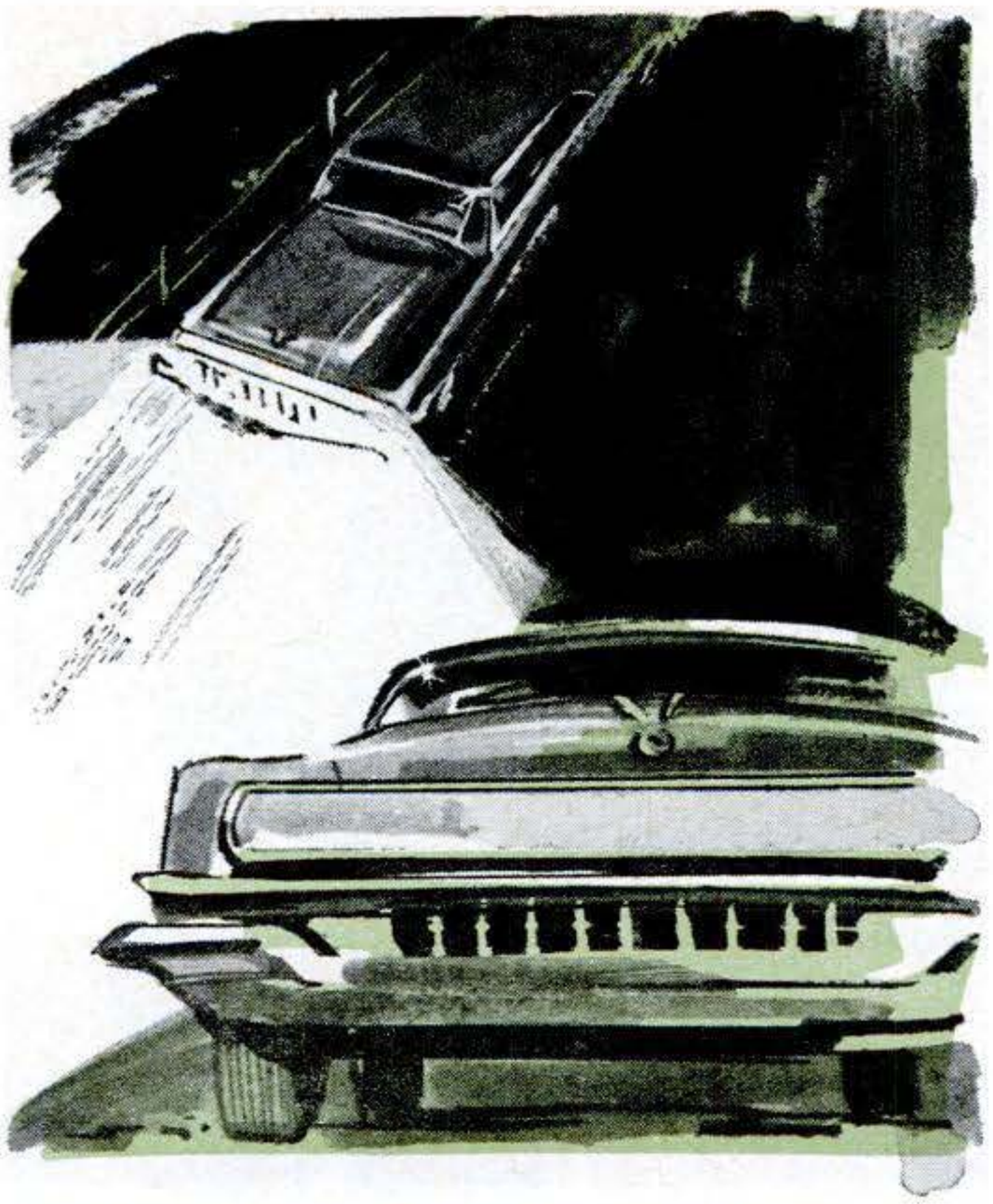
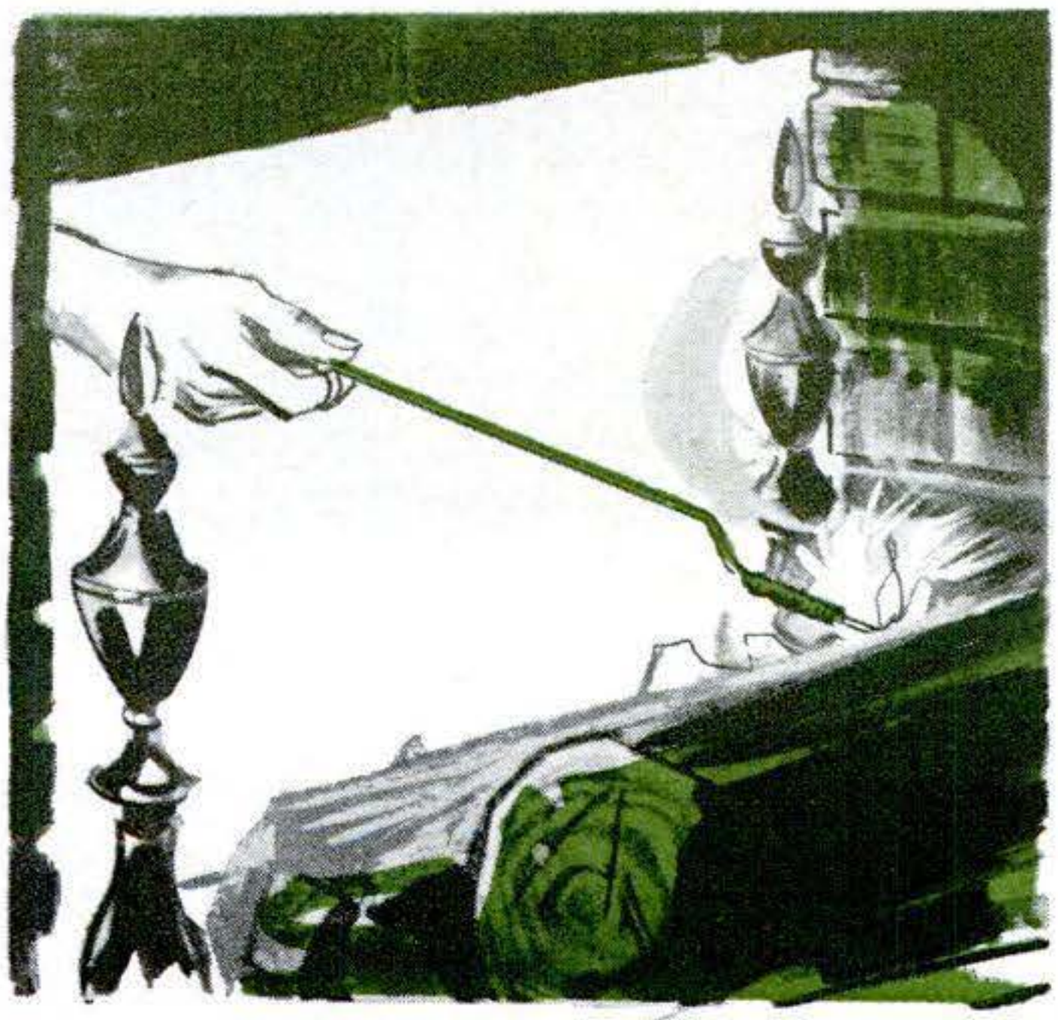
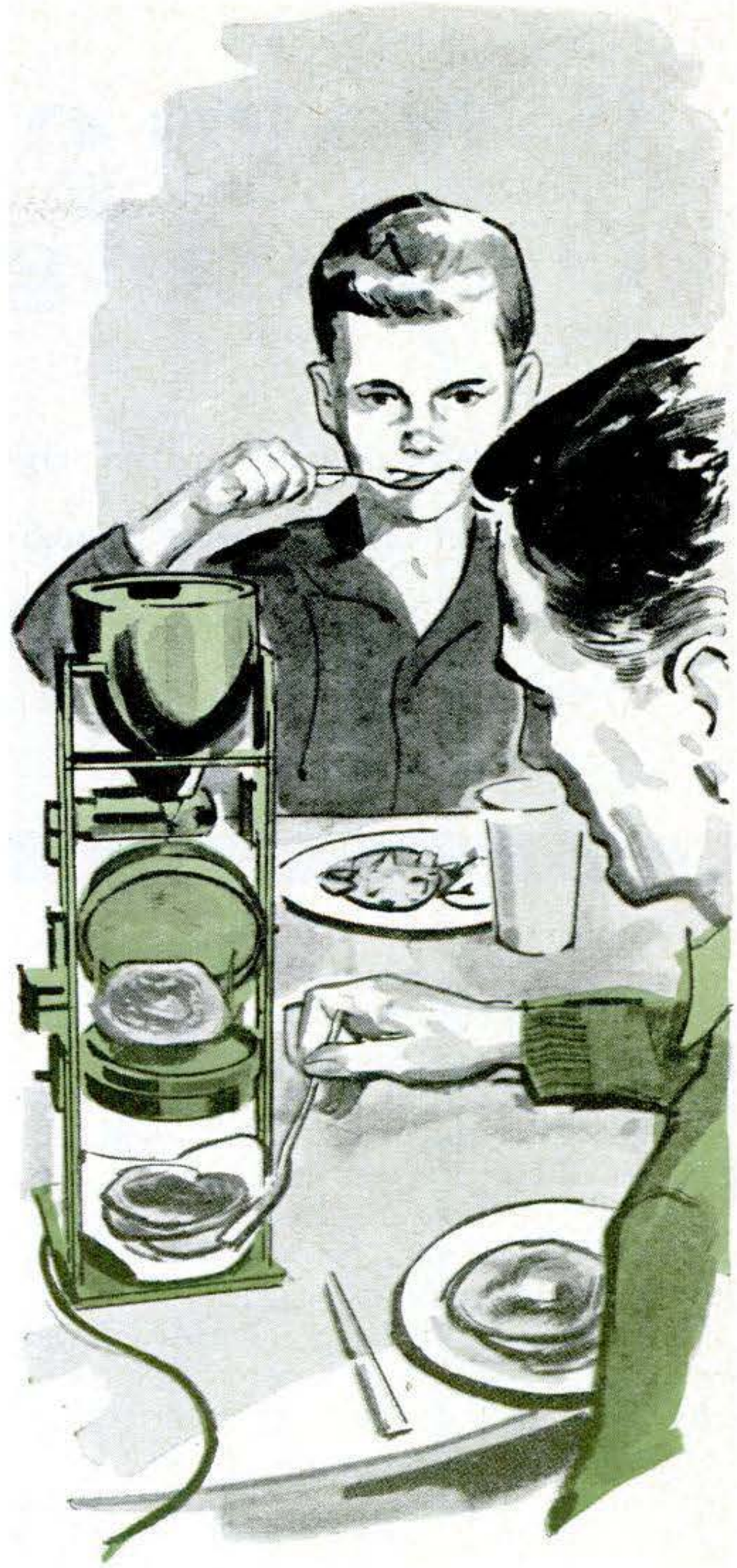


7 Headlamps Broaden Beam. Perhaps the next step after today's multiple headlights will look something like this. Following this patent, three elongated reflectors, each with two bulbs, would completely span the front of the car to cast a wider, gap-free beam.

8 Holder Extends Match. With this wire match holder keeping the flame at arm's length, starting a blaze in a fireplace or barbecue pit should be a cleaner, easier and safer job. The match extender could also prevent many of the painful burns caused by backflash from pilot lights or trapped pockets of vapor in ovens, furnaces and other burners.





9 Table Griddle Flips Flapjacks. You could make your pancakes and eat 'em, too, if you had an automatic cooker like this on the table. A hopper would dole the right amount of batter onto an electric grill. When one side was cooked, the pancake would be flopped onto a lower griddle as the hopper started another.

The following patents *have been issued on these inventions: 1. Patent No. 2,740,997 to P. Gipslis, Vancouver, B.C.; 2. No. 2,699,263 to C. Ore, Harvey, Ill.; 3. No. 2,750,821 to A. Hilsinger, Mt. Tabor, N.J.; 4. No. D 174,817 to R. Kenyon II, Boulder, Colo., 5. No. 2,825,065 to A. Spiezio, Joliet, Ill.; 6. No. 2,751,703 to H. Kietz and M. Schumacher, Bremen, and T. Leman, Eystrup, Germany; 7. No. 2,748,255 to W. Decker, Battle Creek, Mich.; 8. No. 2,822,204 to W. Stegner, Milwaukee; 9. No. 2,830,529 to D. Jaffe, Great Neck, N. Y.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

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5 Ways of Updating an Upright

1 Perhaps you can restore the original finish

2 A coat of paint will work wonders

3 Combine it with a modern built-in

4 Remodel it—into a shapely spinet, perhaps

5 Or you may want to apply a new wood finish

By Ralph Treves and Henry B. Comstock

GONE are the days when a good secondhand upright piano was yours for the trucking charge. Those one-time white elephants are now a fast-moving item. Warehouse waiting lists are long. Bidding at auctions is furious. Even ornately decorated pianos with moth-eaten felts may be upped to the three-figure mark.

Why this boom?

First, because young American families everywhere have rediscovered what an older generation forgot—that do-it-yourself music is fun. Yesterday, it may have been true that everybody laughed when someone sat down at the piano; few knew how to play it. But recent surveys show that one or more youngsters and/or adults in 13½ million U. S. homes are now moderately accomplished pianists. Yet only 9 million families own a piano. For the have-nots on a limited budget, and for the haves in the market for a second, practice piano, a used upright is the obvious buy.

Second, a reconditioned upright is generally a *good* piano. Unlike some of those pretty little spinets that Mom and Dad bought mainly for decoration, it's a real musical instrument. Its sounding board is big enough to deliver full, resonant tone, and its frame is sufficiently strong to take critical tuning and hold it for months of hard-hitting fingerwork.

Third, the once objectionable bulk of an upright doesn't trouble the present-day home owner. Houses are growing bigger with the accent on informal living. An upright is made to order for a spacious family room, or that rumpus corner in the basement.

Fourth, no matter how battered its case or ugly its lines, an old upright can usually be restored or reshaped into a handsome piece of furniture.

A word of caution, though. This kind of renovating or remodeling takes savvy, time, and elbow grease. Don't waste them on a dud. Whether you're shopping for a used piano, or plan to recondition a family heirloom, it will pay you to have a professional piano tuner check on its mechanical condition and give you an estimate on possible repairs. It may cost more than you're willing to spend, or the instrument may even be beyond reasonable repair.

Once you're satisfied that the inner works deserve a case with a bright new look, consider these five exciting ways to bring your upright up to date:

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SOLID CASE—SOLID TONE: Music lovers everywhere are rediscovering the virtues of the old upright—a full keyboard, resonant sound, and a frame that holds critical tuning. Refinished, it can be a conversation piece.

1 Perhaps you can restore the original finish

PIANO cases are generally made of expensive oak, mahogany, walnut or fruitwood. If these fine woods harmonize with your room and the finish is in reasonably good shape, here's the way to make that upright look like new again:

First, take off all removable parts. Start with the lid. Lifting it gives access to front panel latches. Bottom panel latches are directly under the keyboard.

Second, soap the entire case with castile or commercial oil soap (Murphy's) to remove grit and grime. Using a large sponge, apply only the lather, rubbing vigorously. Then wipe with cheesecloth. Avoid splashing excess water, which may seep into felts and under veneers.

Third, if the surface is cloudy, or shows water marks or alcohol rings, apply a polish that contains an abrasive agent, such as fine rottenstone in olive oil, or top-quality auto-body cleaner paste. Using a cheesecloth pad, rub lightly with the grain. Then wash with turpentine.

Next, treat thin-line scratches with touch-up plastic pencils or pigment compounds, both available in various wood shades at hardware stores. After application, allow to stand for several minutes, then wipe with tissue. For dents and deep scratches, "burn in" stick shellac, as shown below.

To treat raised veneer, apply resin glue and press in place with weights or clamps. Protect all surfaces with waxed paper and wipe off squeeze-out before it sets. If the veneer is badly torn, remove and replace it, using matching sections obtainable at craft supply shops.

FILLING SMALL DENTS AND HOLES is a simple matter. Heat a spatula blade with the flame of an alcohol lamp. Then touch it to a shellac stick and rub the gum into the wood. Always use shellac of a wood-matching color.

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PAINTED UPRIGHTS are always in good taste. Spatter-paint treatment, combined with one-tone headboard and baseboard panels, is in keeping with the modern styling of the remodeled upright at the left. The one at right, gracing the home of movie actress Mary Pickford, has a solid finish. It was given several coats of white enamel over a primer coat of white shellac.

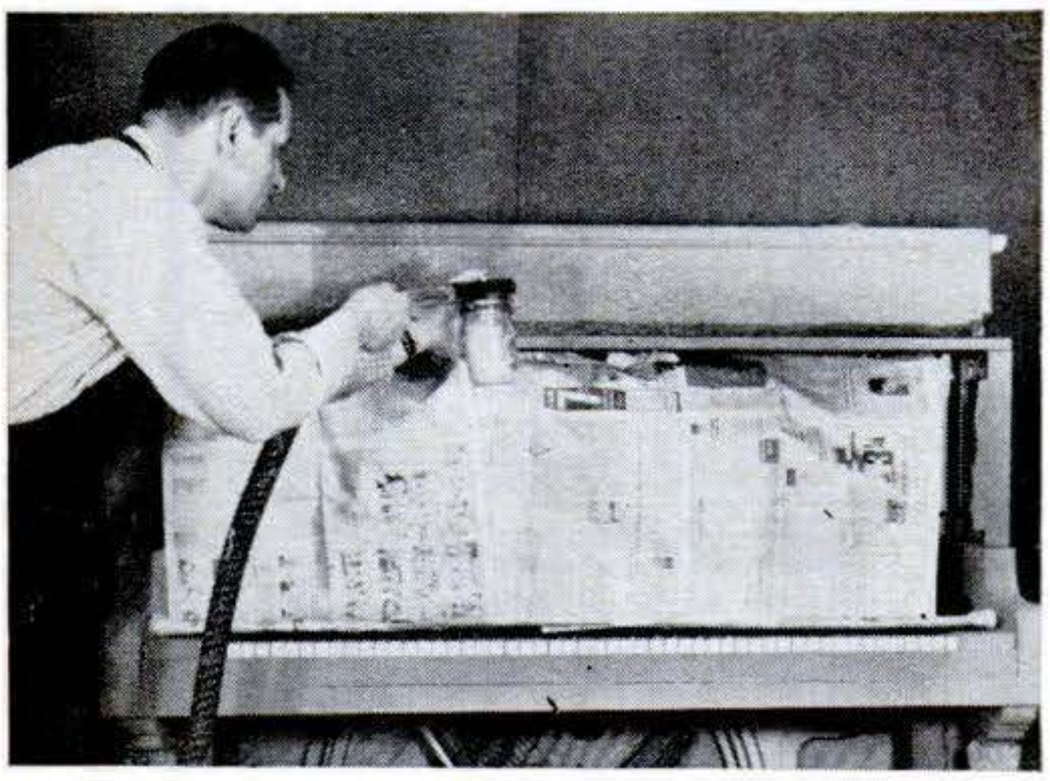
2 A coat of paint will work wonders

FOR that really beat-up piano case with loose joints, plenty of marred or missing wood, and a finish that is deeply alligatored, painting may be your best bet. Either sand away the finish, or use a chemical remover. Then snug up the joints with glue blocks and screws, and fill out the low areas with wood putty. Next, coat the entire case with white shellac. After that has dried, rub down with a medium-fine grade of steel wool.

What kind of paint is best? That's up to you.

For an antique-ivory finish, apply two or more coats of flat oil paint, each rubbed smooth, after two days' drying time, with triple-0 steel wool. After the final coat has been leveled, give it a wash with turpentine, barely tinctured with a squeeze of burnt umber. Let this wash stand for 10 minutes. Then moisten a rag in pure turps and wipe off the surfaces, leaving only a bit of stain in the recessed molding areas.

Want something more modern? Then you might go for one of those spatter paints that come in factory-mixed color combinations, and are applied with a paint gun or vacuum-cleaner spray attachment. Or consider brilliant decorator-color lacquers. Admittedly, it takes an expert to brush them on. But why be an expert? You can now buy these lacquers —or plastic paints, if you prefer—in convenient aerosol cans, and spray the case with a succession of light, smooth-drying coats. A bit of rubbing with rottenstone, afterward, produces mirrorlike surfaces.



VACUUM-CLEANER SPRAY ATTACHMENT does a good job of gunning on spatter paints. Thin the commercial mix with a bit of water, and keep the spray tip a foot away from the work.

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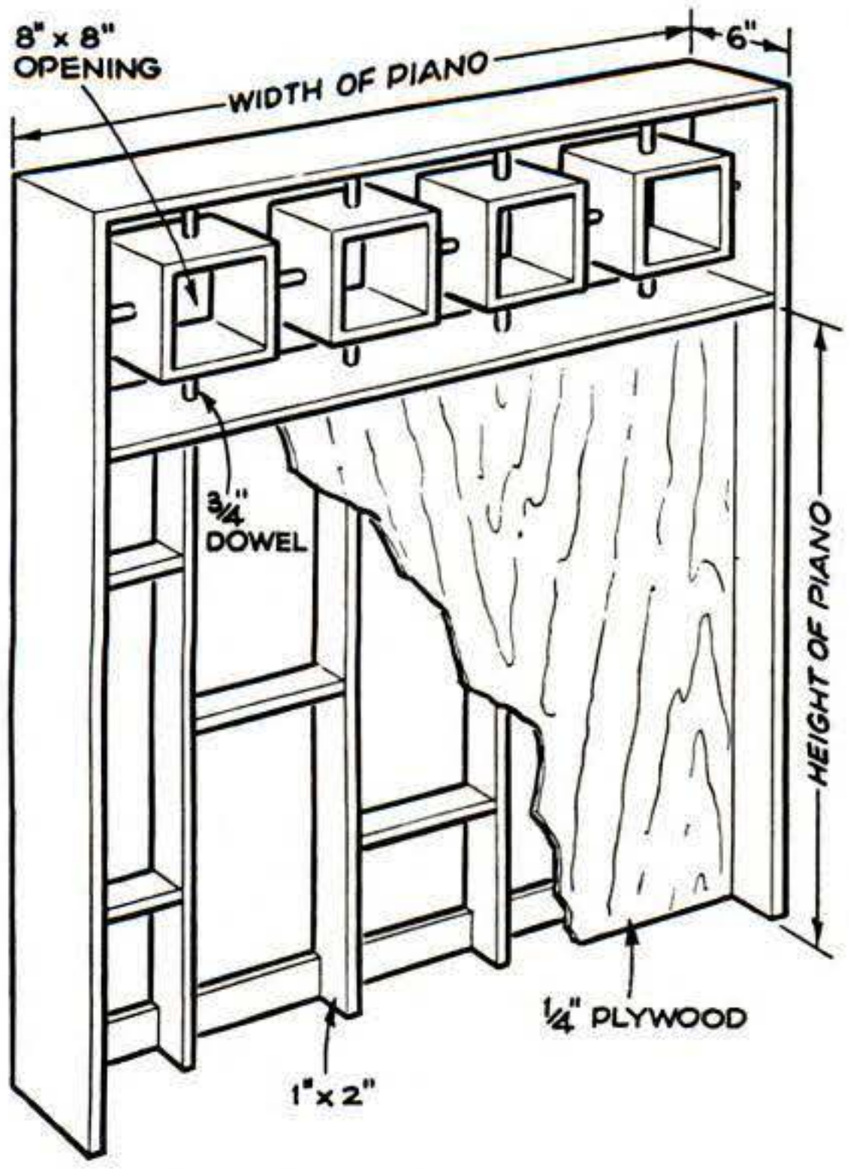
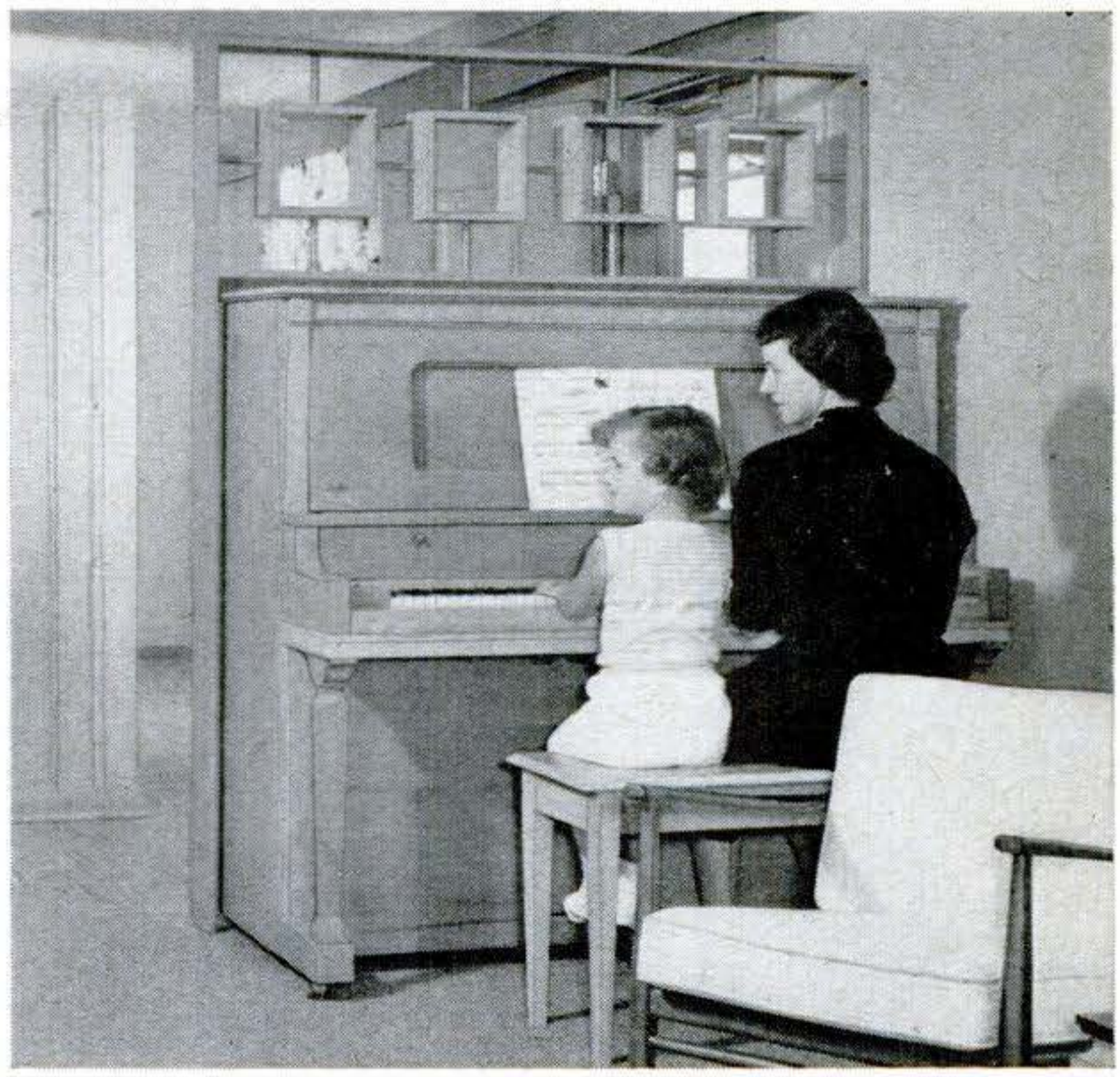
3 Combine a piano with a modern built-in





ROOM DIVIDER IN THE MODERN KEY: Lightening the finish of a dingy old piano for a pale butternut stain wasn't an easy chore, but the Harold Schiermans of Lancaster, Wash., are determined people. They sanded and sanded again. The result, combined with a novel backboard grille, was this striking space separator. The casters were retained to keep the piano mobile.

ONE unusual way to treat that old upright is to make it a component of some larger unit, such as a built-in room divider, or music center. Pictured above is one of these projects. When the Harold Schiermans of Lancaster, Wash., wanted to rejuvenate their dark old upright, they called upon architect Frederick A. Long of Spokane for help. He gave them this pleasing plan.

Once the design was settled upon, the Schiermans sanded the case smooth, then brushed on a coat of butternut stain and wiped it off again almost immediately. As soon as it dried, they followed with a sealer coat of white shellac, then a coat of high-gloss varnish. After rubbing with fine steel wool, the old box was ready for a final fillip—a satin-varnish coat, again carefully rubbed down. The backing panel and new grillework above the case were given the same painstaking treatment.

Naturally, not every piano case warrants such attention. If its basic styling is bad, or the finish beyond restoring, you may want to build a completely new case around the insides.

One interesting treatment is to recess the piano in a partition wall, with only the keyboard and toe block protruding into the room. If you do this, the new concealing wall panels should be removable, to permit access for servicing. Long openings must also be provided, either above or at the two sides of the piano to prevent sound damping. These openings may be covered with grille cloth, thus making them an attractive feature of the installation.

Still another possibility is a large plywood cabinet, housing not only the piano, but all of the other components of a music center—TV, radio, phonograph, speakers, and storage space for records, books and sheet music. Such a cabinet can take the form of an "island" at the center of a room, or be used as a room-divider. To make it more compact, place the piano and the other elements back to back.

Simple, contemporary lines are best for this project, with either a lacquer finish (often two colors are effective) or a natural finish applied to furniture-grade plywood.

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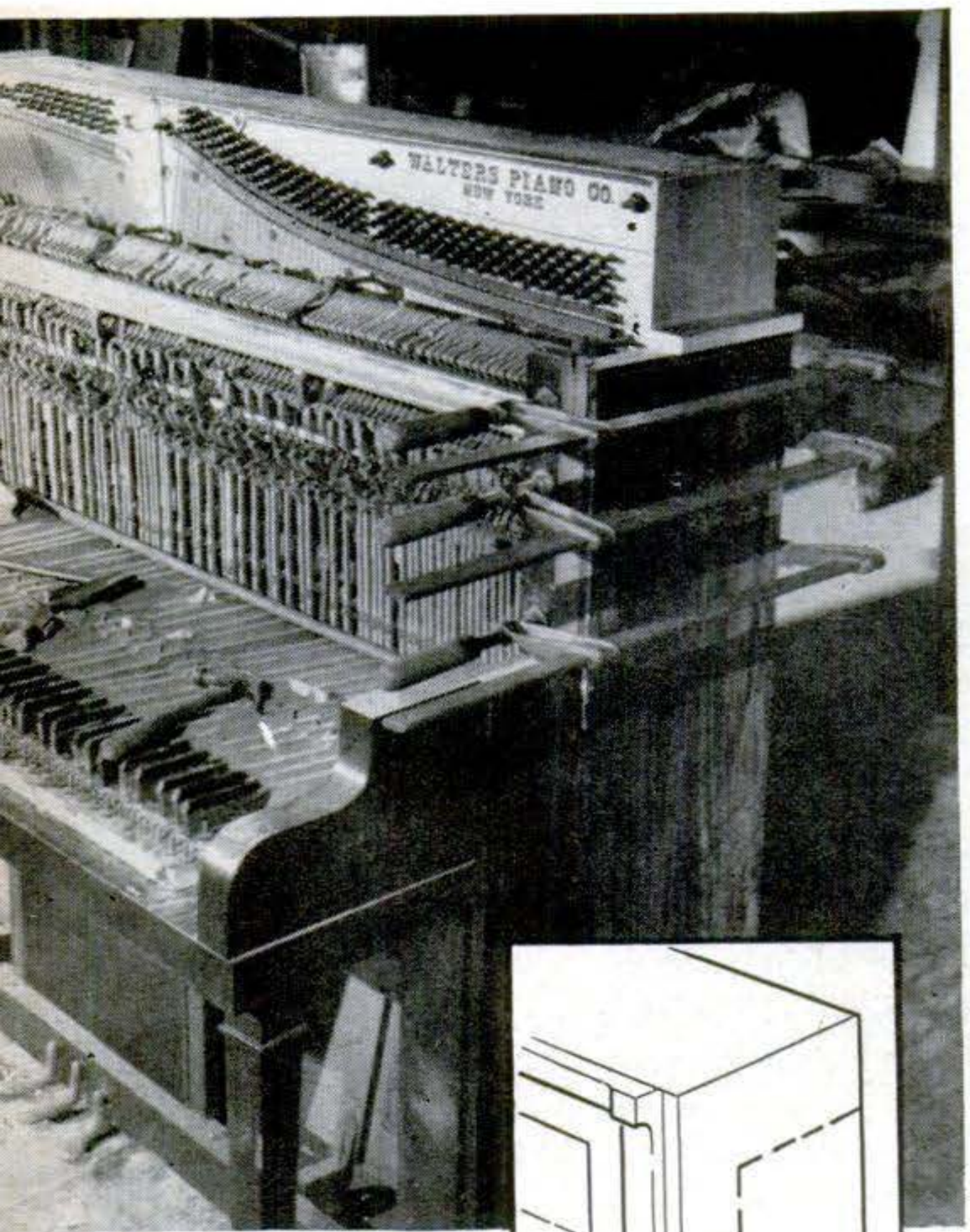
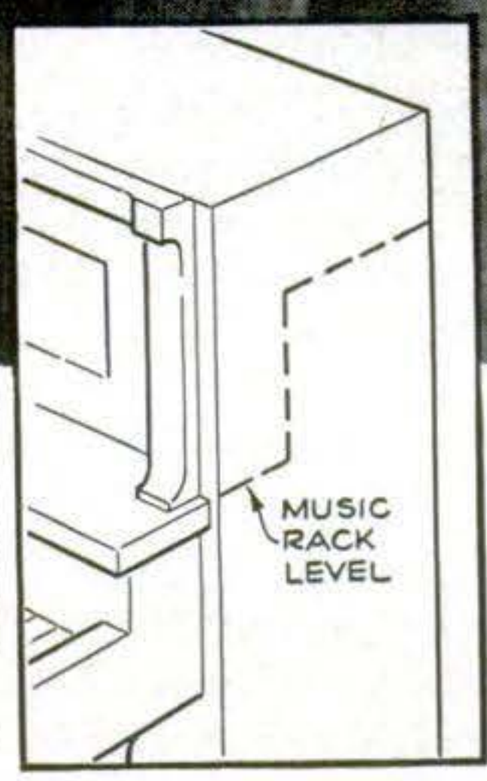
4 Remodel the piano—into a shapely spinet, perhaps





SIMULATED SPINET calls for major surgery. The case was cut down, edge veneering applied (above) and a box placed over the string frame. Result: lowered contour (below).

AN OUTSIZE case and garish ornamentation can frequently be treated best with surgery. That bulky, old-fashioned look may be due largely to massive, carved legs. Sawing them off and replacing them with more graceful wood turnings isn't difficult. Or you may prefer simple metal bars—either of brass or black iron. Whichever you use, make sure that these new legs carry their share of the piano load. Unlike concealed installations, where the case is pinned in place against a wall, a free-standing piano may topple forward if the legs or the toe blocks are removed.

Excessive carving and molding trim can be leveled or stripped off with a sharp chisel. In that case the raw wood beneath should be stained to match the rest of the finish, or covered with veneering.

Making a spinet console involves cutting away part of the case at the front right up to the string frame, removing the heavy lid, and substituting a shallow enclosure of thin plywood. A long, narrow mirror, attached to its face, creates the illusion of a substantially lowered case.

Start by stripping off the lid and front panel, exposing the string frame and hammers. Strike several keys and note the clearances needed for their operation. Then mark the sides of the case with chalk for a stepback that will give this clearance. Saw along the vertical and horizontal lines to remove the unwanted side sections.

Next, cover the new edges made by the saw cuts with matching veneering. Make the face, sides and top of the narrow box that will cover the upper section of the string frame of ½″ veneered plywood, and use ¾″ veneered plywood for both the false lid that attaches to the sawed-down piano-case sides, and the new front panel. Unlike the one it replaced, the latter isn't hinged, but should be held with side clips accessible from the top, so it can be taken out for tuning. The narrow upper box should also be removable, for access to the tuning lugs. Attach hooks to the inner faces of its sides, with mating screw eyes driven into the string frame. Have the mirror cut to size and drilled for rosette screws.

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You may want to apply a new finish

IF YOU'VE latched onto a fine old upright piano with gracious lines and the hallmark of quality—a Steinway, Knabe, Mason & Hamlin, Aeolian, Kranick & Bach, or Chickering, perhaps—you have an instrument that may well deserve a complete refinishing job. Don't be surprised if professional estimates for such work run higher than the initial price of the piano. Remember that it must be carted off to the skilled artisan's shop, where he will spend two weeks or more of painstaking effort, then bring it back again. If your pocketbook can't stand the strain, give a thought to tackling the chore yourself. It may tax your patience, but if you have a feel for fine craftsmanship, the experience and the final result will be richly rewarding. You'll also understand why professional finishing estimates come high. Here's the procedure for doing it yourself:

1. Disassemble the cabinet. Remove the top lid, front and bottom panels, music rack and keyboard cover.

2. Remove the old finish. Spread on paint remover, working it in with an old brush. Scrape off the muck with a broad putty knife. Use an old toothbrush for carvings, scrollwork, etc. A piece of steel wool on a thin stick gets at hard-to-reach carvings. If the new color will be much lighter than the old, use household bleach to remove the remaining stain.

3. Wash with solvent. Apply turps or benzene with a padded cloth to clean up softened paint and remove waxy deposits. Wipe with another, clean cloth and let dry.

4. Sand. Triple-0, in a sanding block, is right.

5. Filling and patching. Use shellac stick (neutral color) to fill holes, dents and scratches. Glue down lose veneers and patch torn spots. Sand again.

6. Wood filler. With turps, thin wood filler that has been tinted to match the final stain. Brush it on. Work the filler into the grain with a cloth or felt pad until it begins to harden. Then wipe off excess with a clean cloth. Do a small section at a time because this filler hardens like stone.

7. Staining. Use an oil stain. Brush over the entire surface at one time, for uniformity. Allow time for the stain to penetrate deeply (about an hour). Then rub off excess with a lint-free cloth, and sand the surface. Check for uniform density of the color, and re-do any necessary parts.

8. Sealing coat. Brush on white shellac with long, overlapping strokes. Use a small brush to shellac all moldings and trim. Don't let the shellac pile up at indentations. Sand lightly and apply a second coat. Sand again, making sure to smooth down any air bubbles.

9. Finish coat. Use clear brushing lacquer, applied with a full-bodied brush in long, quick strokes. Cover the entire surface. Watch out for dust. Allow the first coat to dry (it will, very quickly), and rub hard with a felt pad dipped in water-soaked pumice powder. Wipe the surface meticulously with a damp cloth to remove any trace of pumice before applying a second lacquer coat. Repeat this procedure until you have laid down at least four lacquer coats. After the final one, rub, rub, and rub again.

Materials needed for finishing: Liquid turps or benzene, Triple-0 sandpaper, tinted wood filler, white shellac, shellac stick, oil stain, brushing lacquer, fine pumice powder. Also brushes, felt rubbing pad, alcohol lamp, spatula, cheesecloth, and a broad knife.

ELBOW GREASE, combined with a sanding block, steel wool and pumice, is the chief requirement for a fine new finishing job. Use sawhorses to support the removable parts. END

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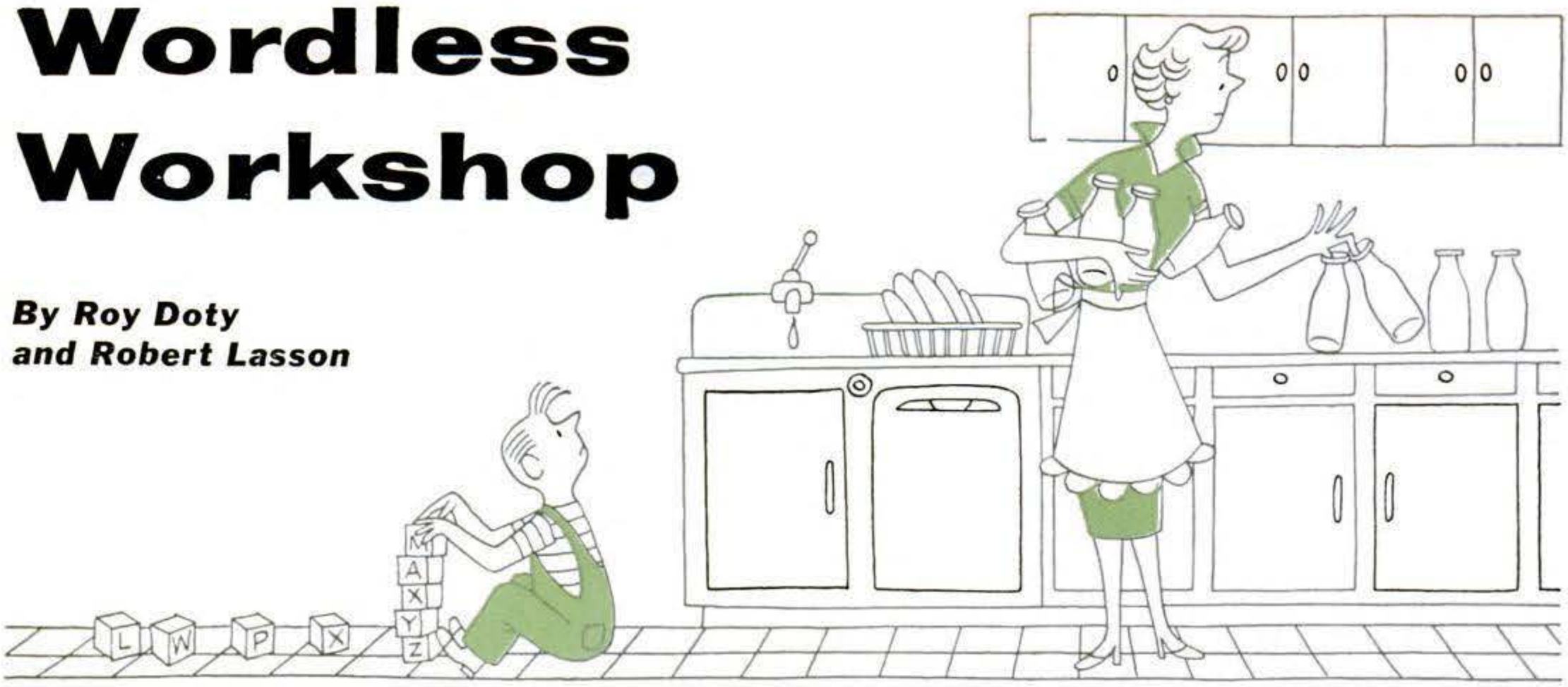
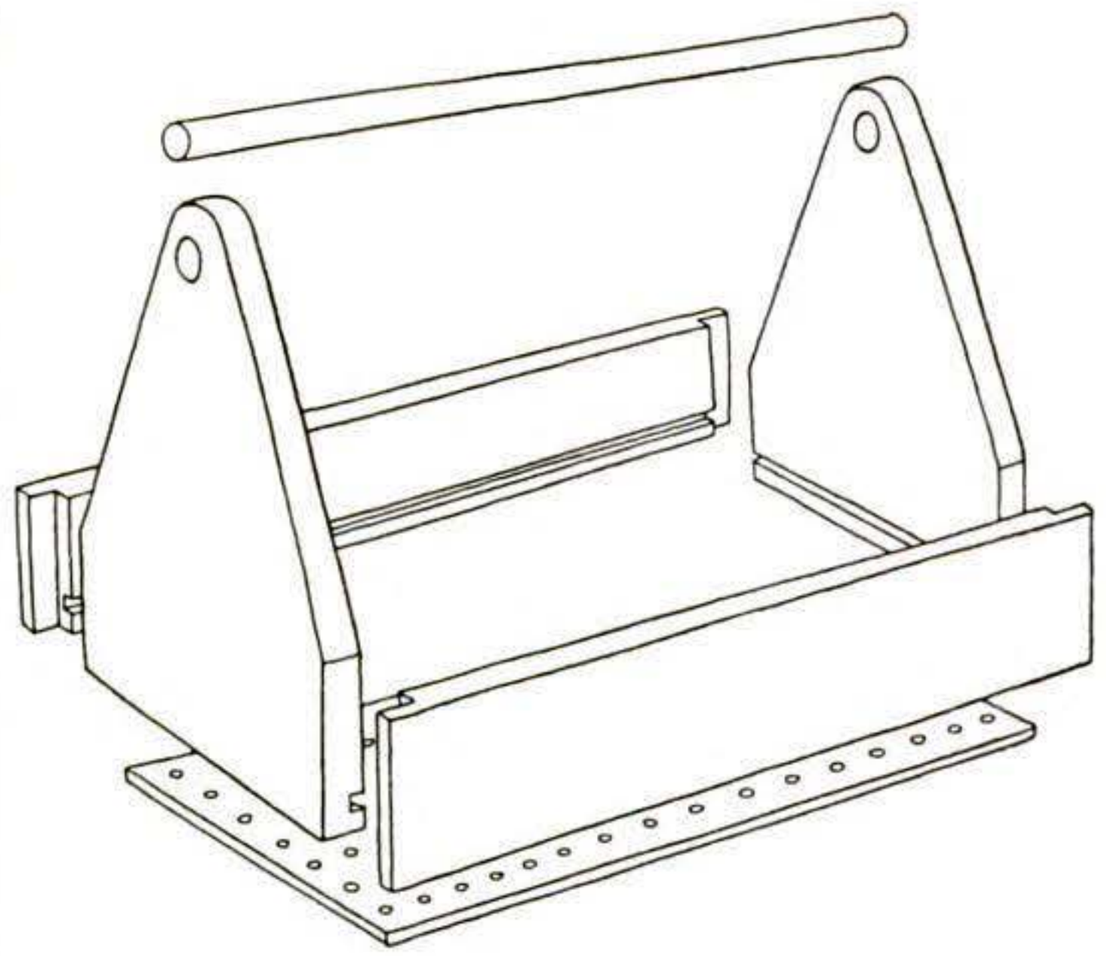
Wordless Workshop

By Roy Doty and Robert Lasson





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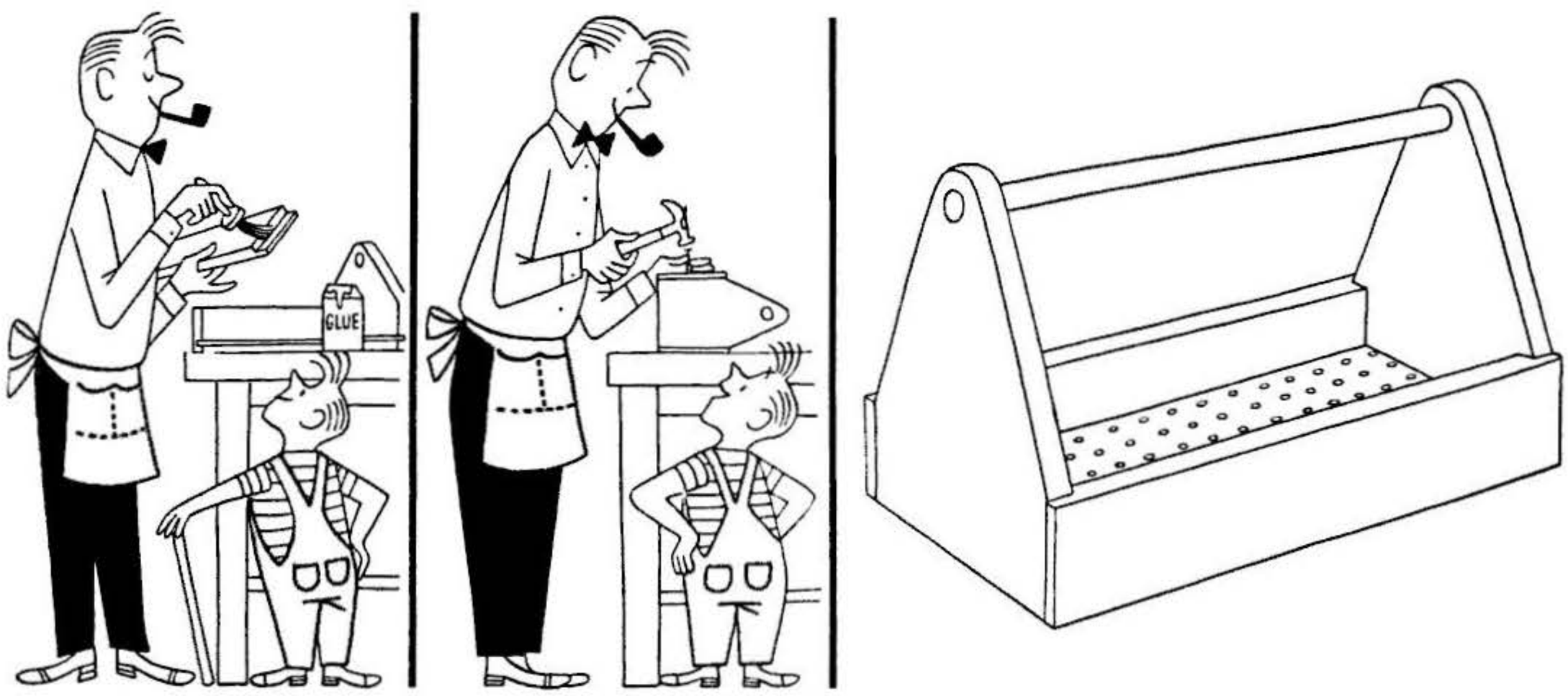

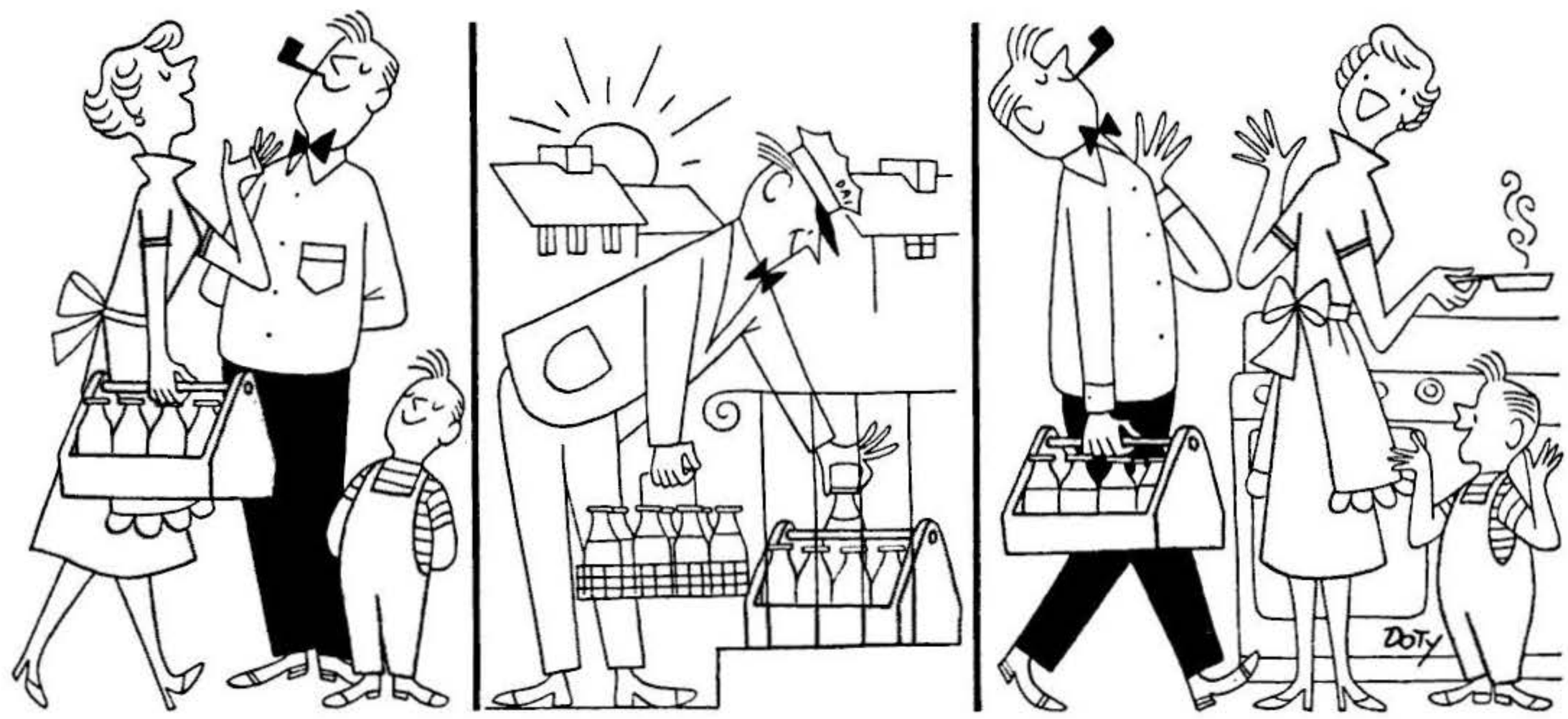

Next Month: A neat way to keep a pup safely tied but untangled

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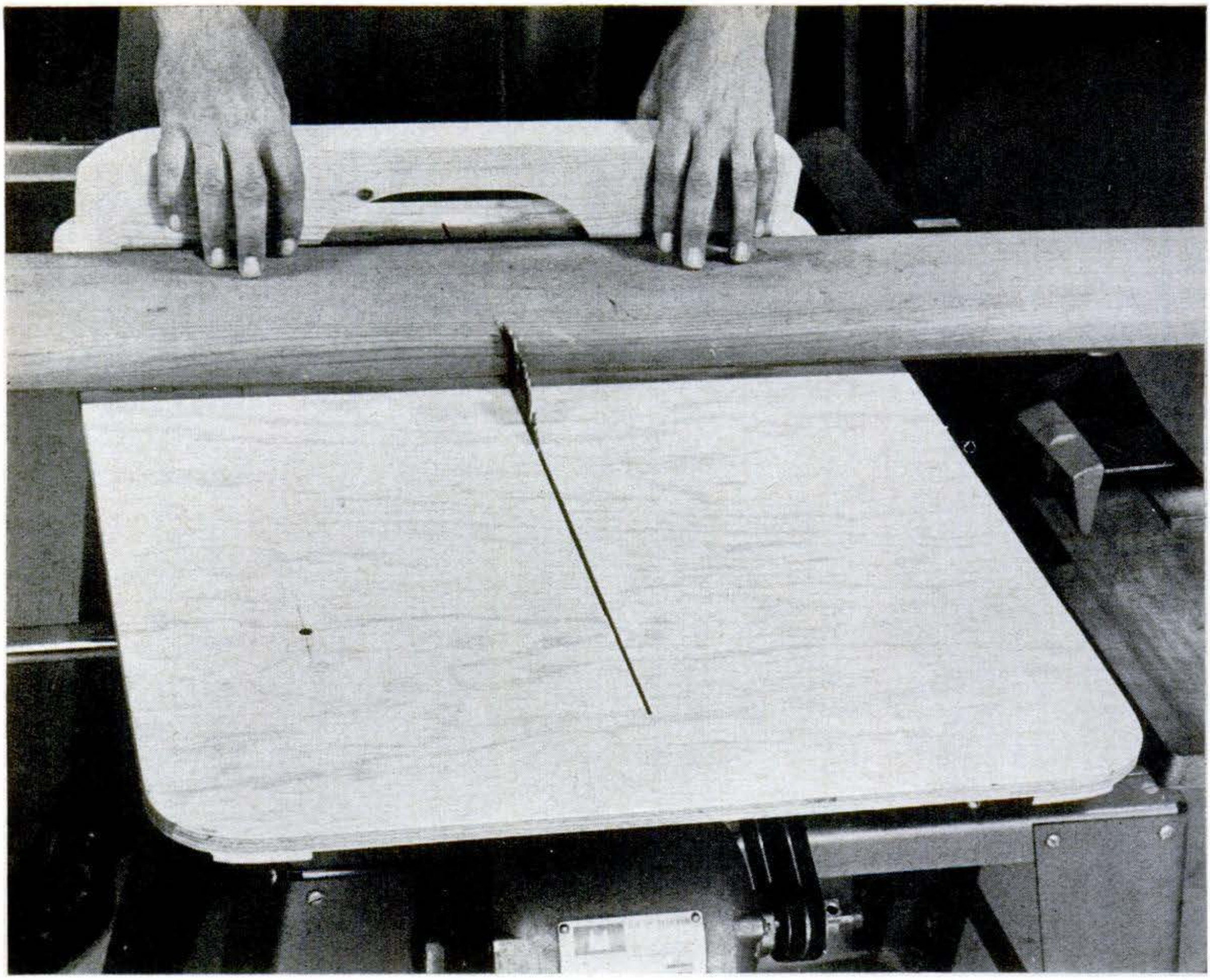

How to make

A Sliding Table for a Table Saw

Using it, you can zip through all cuts more easily and accurately

By R. J. De Cristoforo

FOR those tricky table-saw operations that make you wish you had six hands, you can't beat a sliding saw table. Industry has used such tables for years to guarantee hairline accuracy for both routine and difficult cuts.

You can get the same unerring accuracy with the sliding-table accessory described here. It's the most versatile bench-saw attachment you can own—and the easiest to set up. You can't buy anything like it. But you can build this tried and proven model in less than a day. And even if you go for new plywood and

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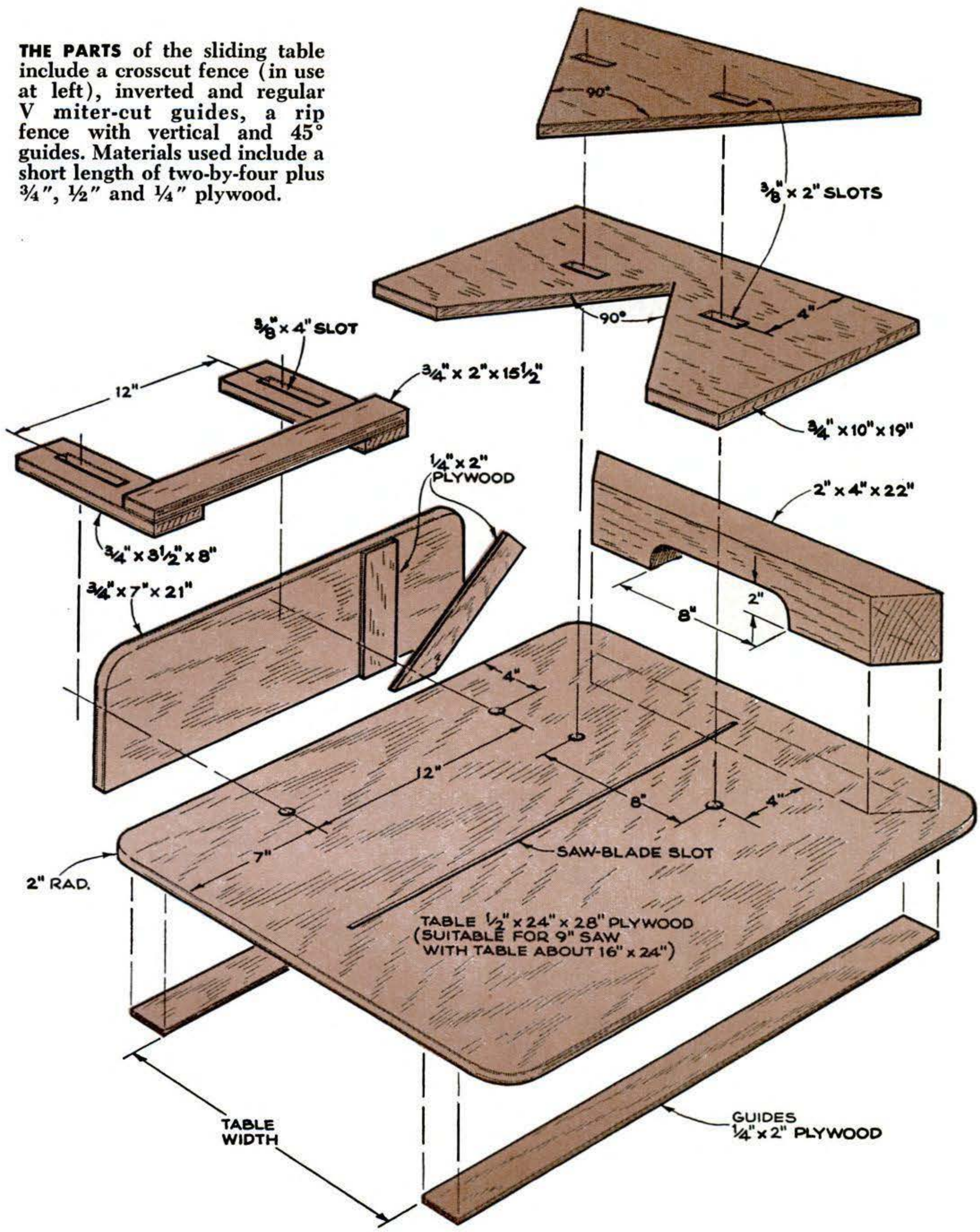
THE PARTS of the sliding table include a crosscut fence (in use at left), inverted and regular V miter-cut guides, a rip fence with vertical and 45° guides. Materials used include a short length of two-by-four plus ¾", ½" and ¼" plywood.



hardware, your total investment should come to less than five bucks.

Specifically, how will this sliding saw table help you?

First, it will ease work through the saw with absolute precision, because its guides move *with* the table—not independently. There's no chance for the stock to creep or pivot during a pass. That means no binding, or kickback—no blade-damaging friction set up by bias pressure or weaving. You'll get fast cuts, as well as true ones.

Second, this sliding table will let you crosscut long boards easily because it's considerably wider than the regular saw

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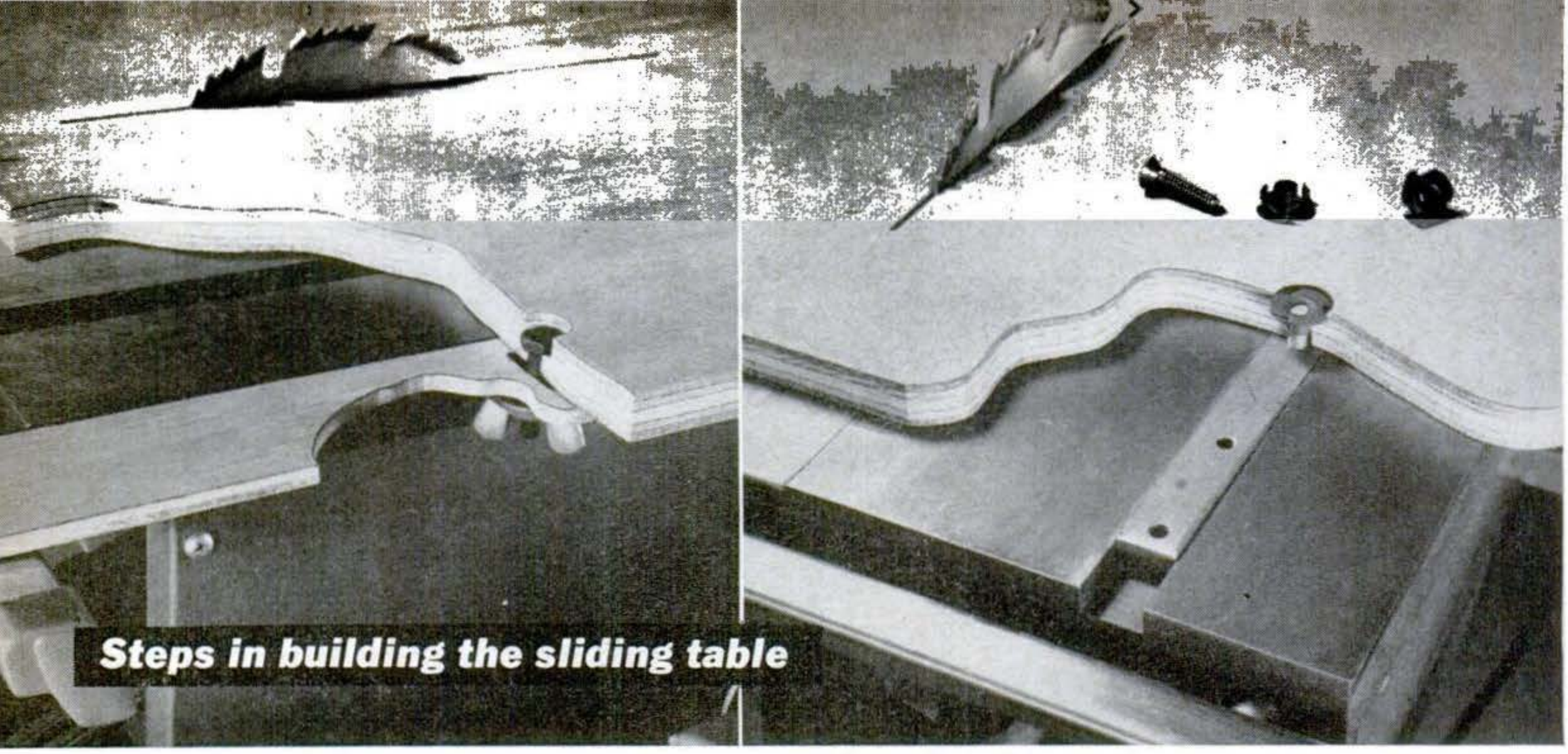
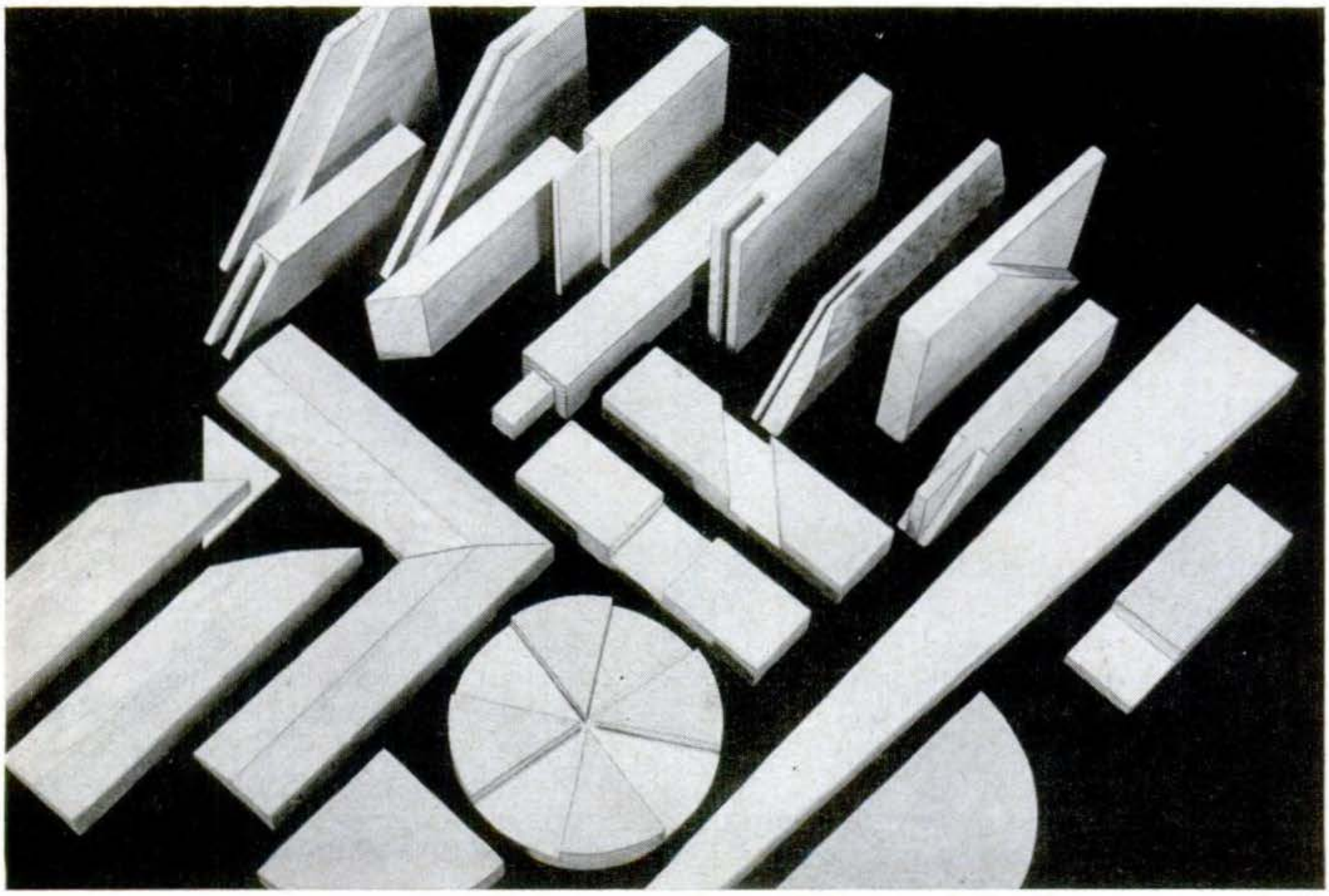


YOU CAN ATTACH TABLE TO SAW in two ways. Screw or bolt wood guiderails to the underside of the table—these slide along the sides of the saw table. Or bolt the table to wood or steel bars that slide in the saw's miter-guide grooves. Projections above the table are avoided by countersinking bolt heads (rail method) or using Tee-nuts (bar method).

table beneath it. Also, it has a crosscut fence with a blade-straddling yoke at its center to back up the work on both sides of the kerf and prevent chattering and wood-splitting "breakoffs."

Third, when you want to cut right- and left-hand miters, this rig will let you do it without resetting a gauge. There'll be no more hard-to-prevent adjustment errors, resulting in mismated joints, resawing, or scrapping of stock that's been cut off too short to be reclaimed.

Fourth, there's no need for special jigs and awkward clamping when you saw



THESE ARE TYPICAL JOINTS you will do more easily, accurately and safely on a sliding table. Some of them can't be done except with the table or special jigs and fixtures.

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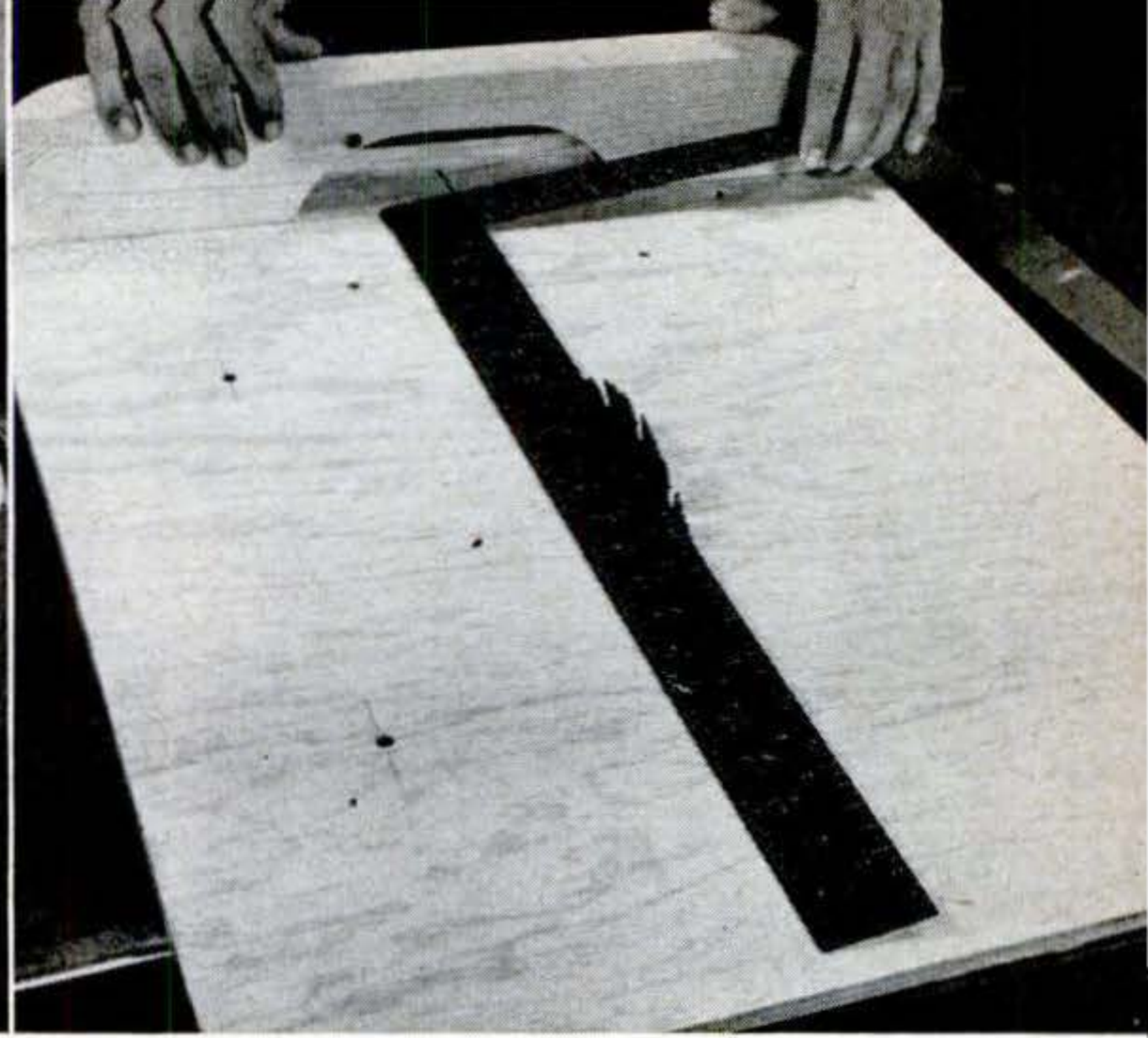
SAW CUTS ITS OWN SLOT as you raise the blade with sliding table in working position. A sharp, hollow-ground blade teams up best with the sliding table, but any kind will work.



USE A CARPENTER'S SQUARE to set the crosscut fence at right angles to the saw blade. Once aligned, clamp the fence and drive countersunk screws upward through the table.

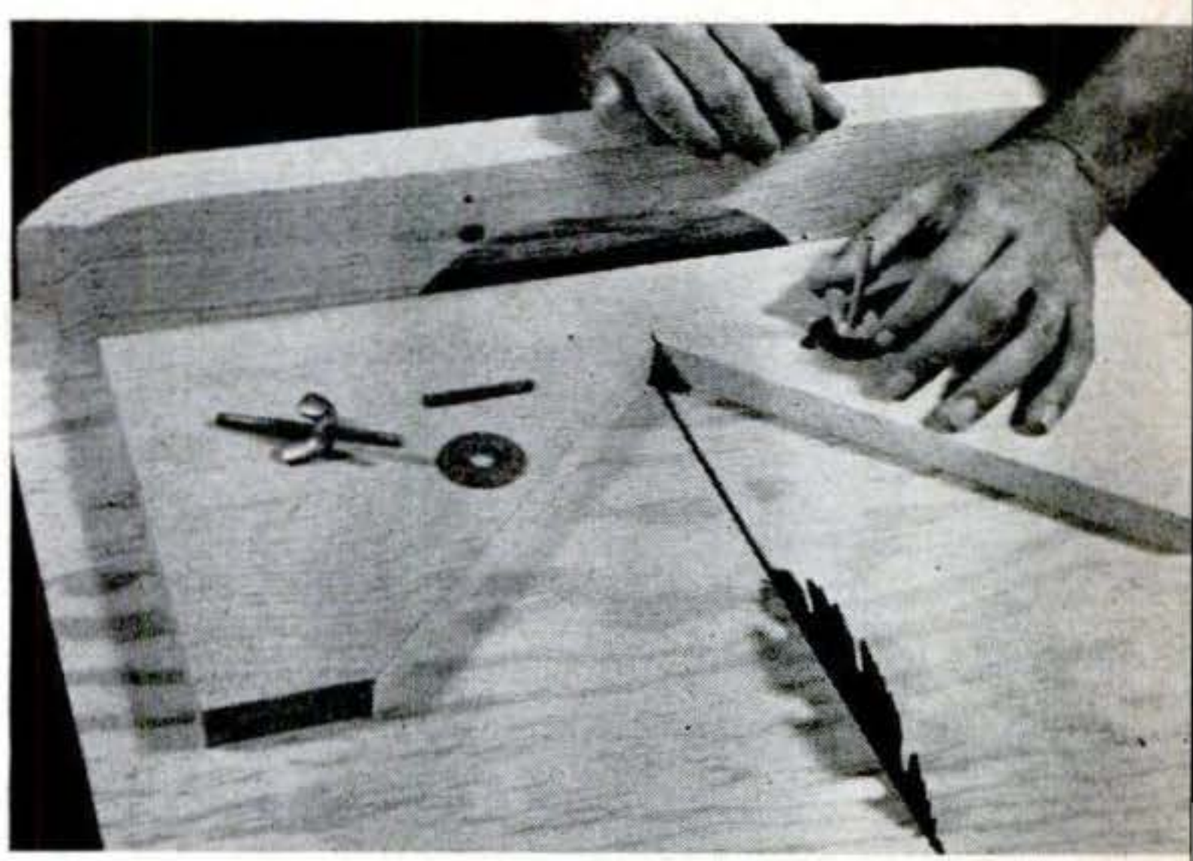
tenons, tapers and wedges. A combination rip fence and taper guide takes care of conventional cuts with the grain. It also stands high enough above the sliding table to provide ample clamping surfaces for work run through the saw edgewise. For accurate and speedy placement of strips to be tenoned, splined or half-lapped, you simply attach a vertical or 45° inclined guide block to the rip fence with a couple of wood screws and butt and clamp the stock against them.

Fifth, you can center disks or other circular work automatically in line with the blade, for radial cuts across them.

Sixth, the sliding table holds irregular stock firm while you cut a straight working edge.

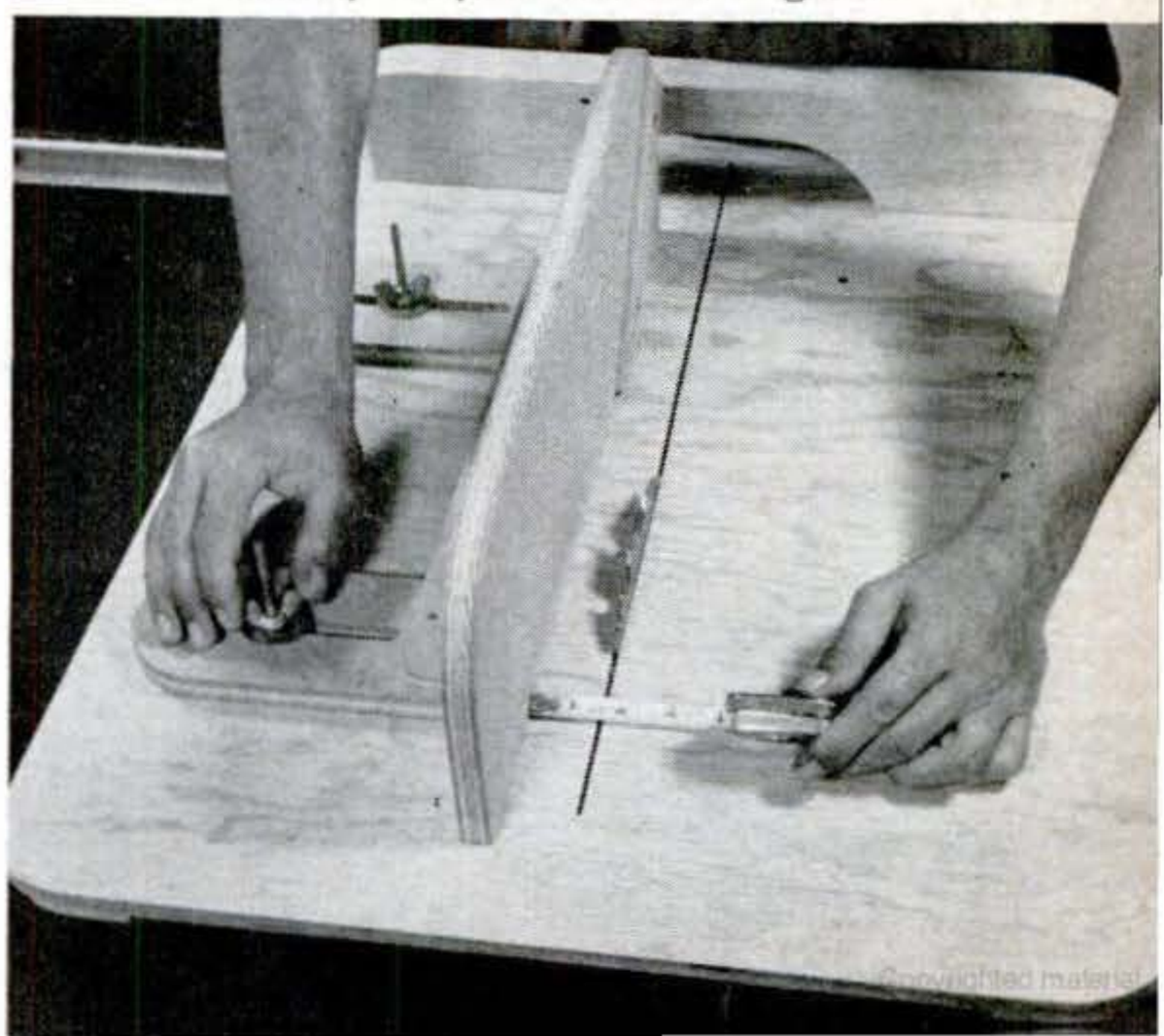
Steps in making the table. Remember that the quality of the work the table will do is entirely dependent upon the accuracy of its parts, and the nicety of their assembly. Use a good grade of plywood for the table and guides. The table size is not critical. But the auxiliary table should be larger than the original saw table, without becoming unwieldy. The thickness of the stock you use will reduce the blade projection by just that much, so the sliding table should be thin. But don't go under ½"—otherwise it will lack the necessary stiffness for dependable cuts.

All other parts should be made either of plywood, or of kiln-dried hardwood. The miter guides must be especially ac-



SLOTS FOR ADJUSTMENT are cut in the V miter-cut guide. Attach it by pushing headless ¼" bolts through the slots into holes in the table. Wing nuts go on top, Tee-nuts on bottom.

LINE UP THE RIP FENCE for use by measuring from each end of the fence to the blade slot; equal distance indicates they're parallel. Fasten the fence exactly as you did the V guide.



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curate. First lay them out and cut almost to the line. Then finish them off by sanding exactly to size. The miter-cut V blocks, for example, demand a precise 90°. You can also make special guides for cuts other than 45°. Fuss a bit to be sure you get them right; this will pay off.

Parts shown in the drawing are dimensioned for a 9″ saw, with a table measuring about 16″ by 24″. However, they can easily be modified to fit 8″ and 10″ machines.

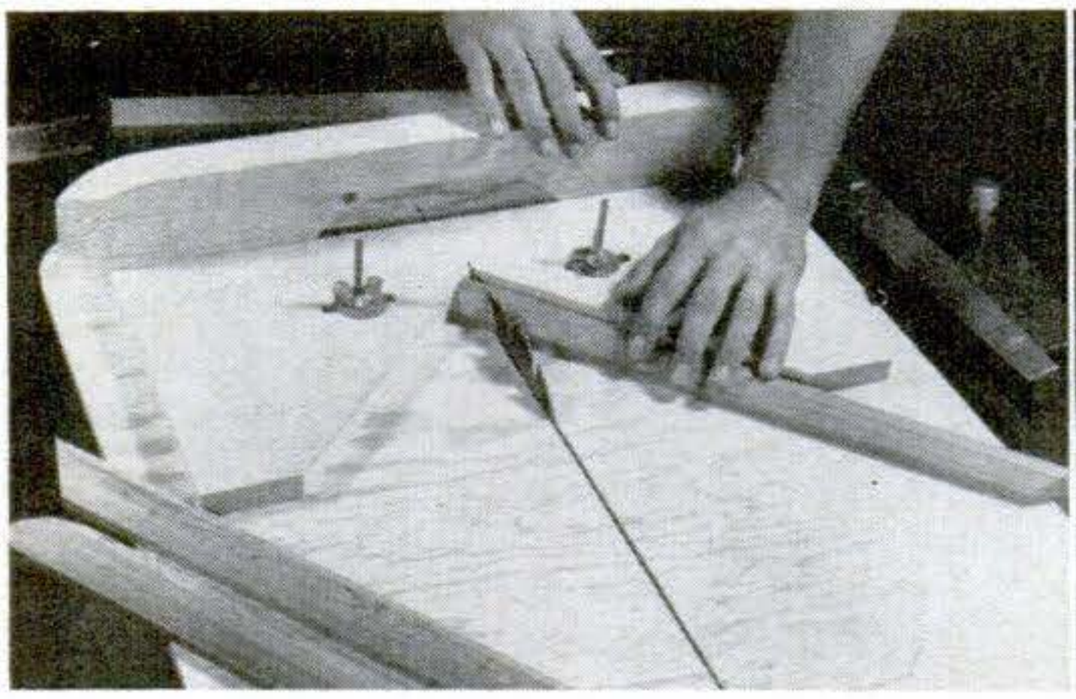
Begin assembling the parts by attaching the table guides to the basic table panel. Set this panel squarely on the saw, with the blade retracted out of the way. Then C-clamp the guides to the sliding table. They should ride against the sides of the saw table tightly enough to prevent any lateral play, yet allow the auxiliary table to slide back and forth freely.

Screws are the simplest device for attaching the guides to the table. Or, to allow adjustment in the guide spacing, you can cut a slot in the guide and bolt it to the table. If there are rip-fence rails that would interfere with a bolt, slot the table instead and use a Tee-nut in the guide. With the guides attached, you can lower the table onto the turning blade and let it cut its own slot.

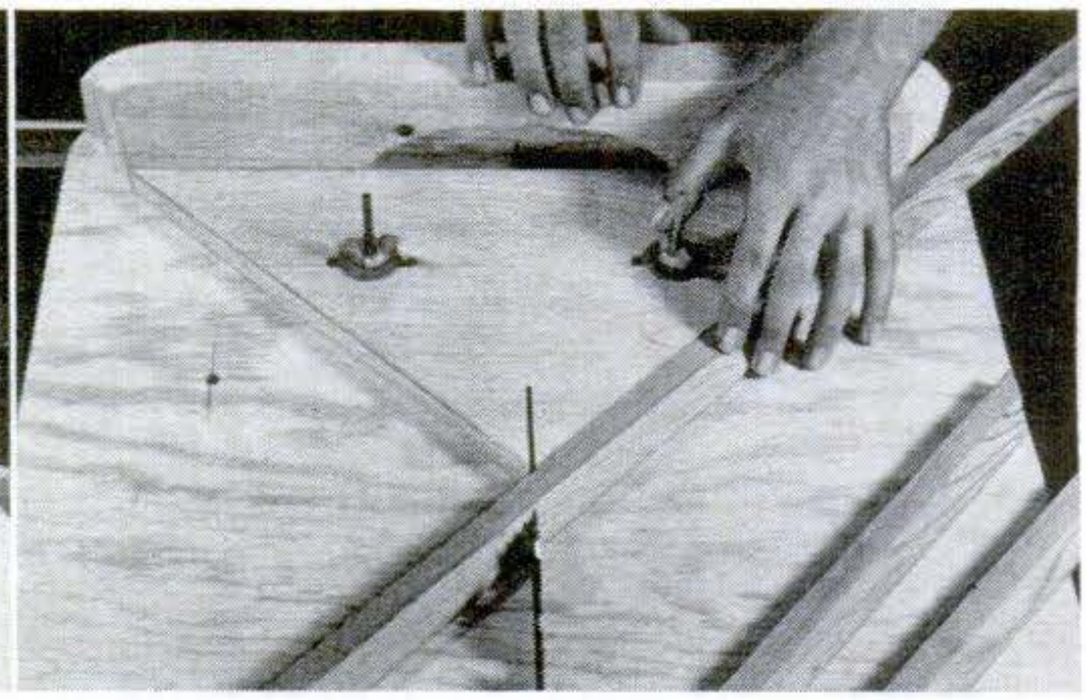
The crosscut fence is screwed in place permanently, but the adjustable fence and both V blocks can be moved. In each case the locking device for these movable parts is the same. Slots are cut in the part and matching holes drilled through the table. A Tee-nut is driven into the hole from the table's underside. The nut takes a headless ¼″ bolt inserted from above. A wing nut with a flat washer under it tightens down on the slotted part.

Finish the parts by sanding them smooth and covering the surfaces with an application of wood sealer or several wash coats of shellac. Wax the underside of the sliding table and the surface of the saw table to reduce friction. END

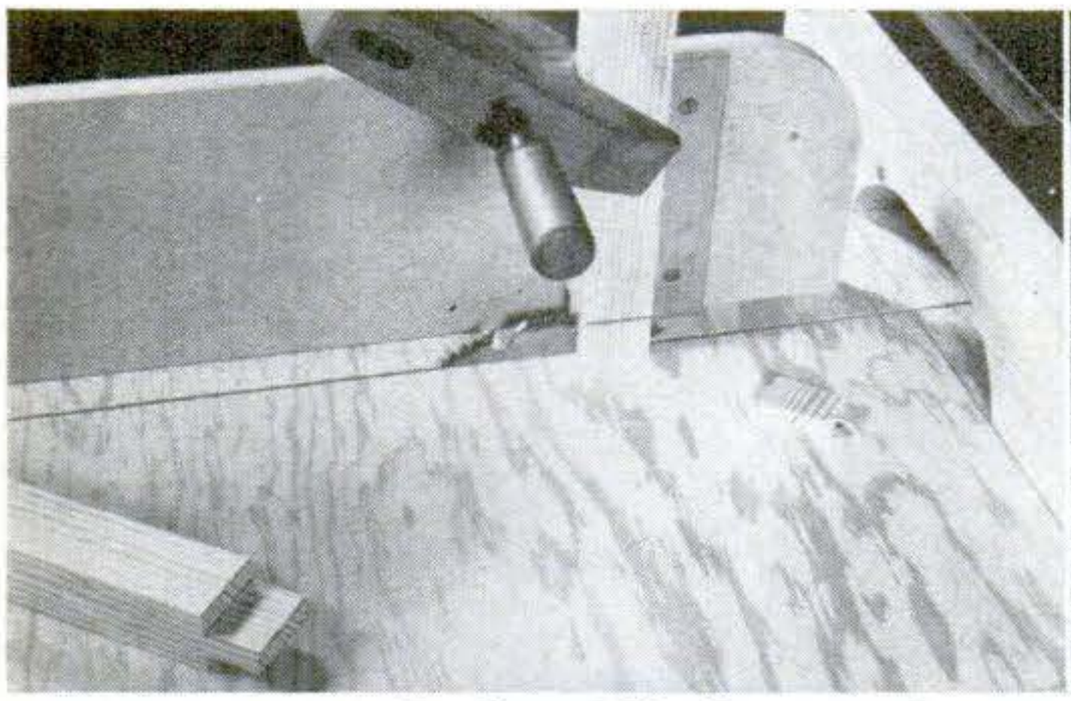
Jobs you can do more easily with a sliding table



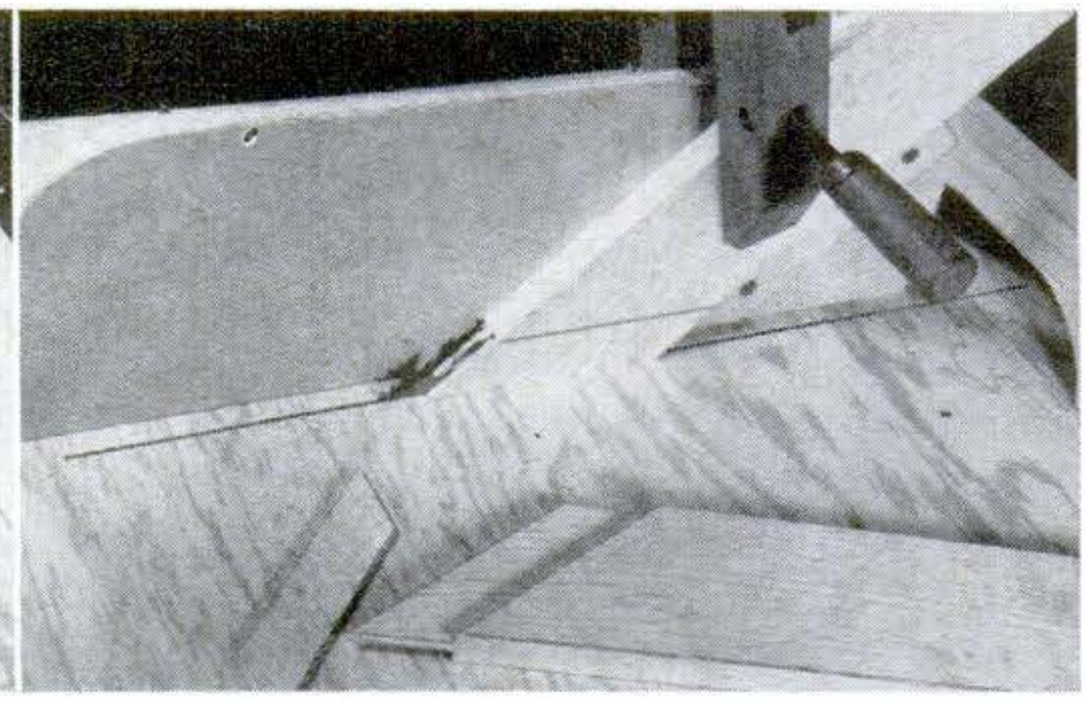
MITER FINISHED PIECES by guiding them with the V block. Piece is held steady as the entire table moves, ensuring a perfect cut.



MITER UNCUT STOCK with the inverted V guide. Pieces need not be finished to size; they can be cut anywhere along their length.



MAKE TENONS and other difficult vertical cuts more safely and easily with a vertical guide on the rip fence for alignment and backing.



TENONING, SPLINING OR HALF-LAPPING a mitered piece requires a 45° guide in place of vertical one. Guides are screwed in place. END

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Trials and tribulations of a home owner's first year, or—

How to Break In Your New House

By John L. Springer

THE housewarming is a memory. You're settled down in your dream house. Then, one day, comes the rude awakening.

"Darling, the bathroom door is stuck," your wife calls, her voice muffled. "I can't get it open."

"Take another soak in the tub," you call back. "I'll have this plaster crack around the fireplace filled in a jiffy."

The honeymoon—with your house—is over. You may even be tempted to write the whole thing off as a bad bargain when flaws begin to pop up like mushrooms after a heavy rain. Take heart. An old saw, "The first year is the hardest," goes for a house, too.

Whether you buy a three-room bunga-

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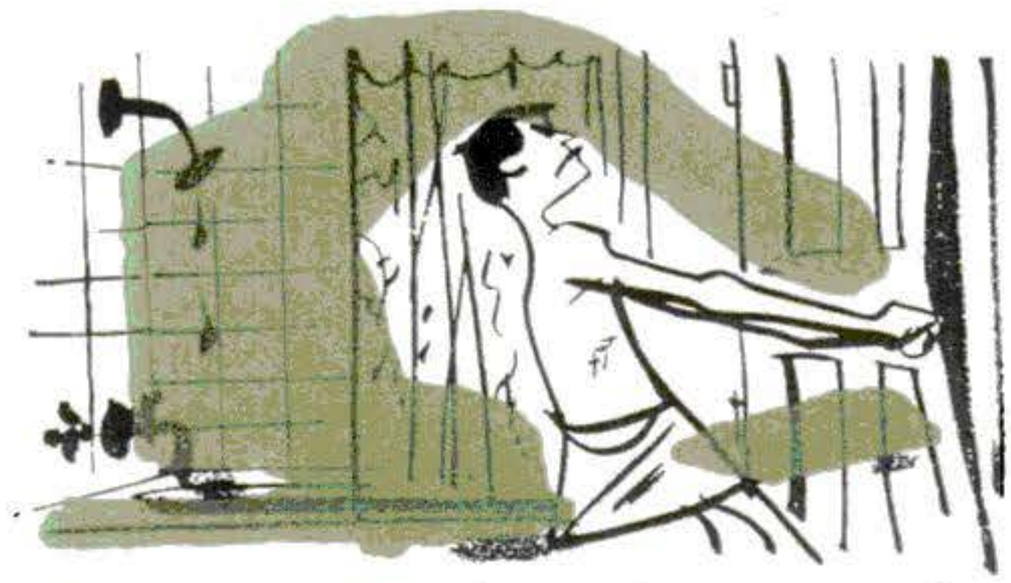
Tips on living with the growing pains of a house

Everybody expects minor faults to show up in a new car. Most of us, however, aren't prepared for them in a new house. But imperfections will crop up in the best construction. Here are some of the problems you can expect during your first year. Take them in your stride. If you think the builder is at fault, ask him to make the repairs or foot the bill.



Doors or windows that stick in wet weather are no cause for alarm. Plane the high spots.

Too cold, too hot? Automatic heating systems have to be adjusted to your way of living.

Note down minor defects over a period instead of pestering the builder with each one.

low or a 15-room mansion, you'll find plenty of imperfections. More than 3,000 component parts go into the average house and materials and installations can't be perfect in every case. Then there is that troublemaking trio; *settling, shrinkage* and *swelling,* over which a builder has little control.

Settling: Even a small house weighs a few dozen tons, concentrated on a small area. The soil below is bound to give a little. So the house settles. If everything went down evenly, nobody would know the difference. But because the soil is softer or the load heavier, some foundation sections sink more than others. Structural cracks appear. Relax. It happens to almost everybody. Minor cracks, around windows and at corners, won't affect the strength of the walls; they just look bad.

Another strain on foundation walls is the wide range of weather to which they're exposed. The base in the ground keeps a constant temperature (about 56 degrees), while the exposed parts may vary from below zero in winter to 100-plus in summer. Some expansion and contraction is inevitable—and so are some cracks.

Shrinkage: Rough framing lumber, even in the best of houses, is never completely dry. If there's uneven shrinkage, plaster cracks in walls and ceilings may occur. Don't rush in to repair them. Shrinkage usually stops within two years. Then you fill in the cracks with spackling compound, smooth the surface with fine sandpaper, and redecorate. In most cases the cracks don't reappear.

If cracks develop at ceiling, window and door molding joints during the dry season, don't worry. They'll probably close up again in humid weather. If not, make a note to fill the joints with putty when you paint.

Swelling: Windows that stick and doors that require a heave-ho to open are part of the growing pains of any house. Even doors that have been conditioned carefully before hanging will swell a little in damp weather. Restrain that urge to grab a plane and start gouging. Gently sand the high spots. If you take off too much the doors may be loose after they shrink.

When your wood flooring begins to "give" a little, just take it. You can't have a perfectly tight floor all year 'round. If there were no hairline spaces between strips in the winter, expansion in the humid summer might cause the floors to buckle.

A wet basement—that bugaboo of new

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If a gap opens between bathtub and wall tile, a good calking job is the simple remedy.

Keep first-year gremlins out of your pocketbook. Get a builder's construction guarantee.

Extreme heat may cause cracks around a fireplace. Filled in, they usually won't reappear.

Floor bouncy in the middle? Braces between joists may have shrunk. Nail them back.

home owners—can be caused by uneven settling of soil around the house. As the soil sinks, it may pitch toward the house, instead of away. When the rains come, the water exerts pressure against the foundation, and may collect in ground pockets caused by rocks or debris. Wait until the ground settles, then make sure that it pitches permanently away from the house.

If the plumbing and wiring are put in right, nothing very serious will go wrong with them. There may be leaks at joints, such as where the bathtub meets the wall tile. That's not the plumber's fault. Chalk up another round for settling and shrinkage. A careful calking job usually stops such leaks.

Stand on your rights. Insist that the builder guarantee all construction, including plumbing, heating, wiring, for at least a year. In fact, when you buy a new house with a Federal Housing Administration mortgage, the builder is required to provide a warranty that all materials and workmanship conform to the approved specifications.

A manufacturer's guarantee comes with mechanical equipment such as furnace, water heater, dishwasher. The same is true for national brand-name makers of doors, floor tiles and similar items.

When a builder signs a contract to put up a house, he usually promises that all work will be done in a "good and workmanlike manner." That's a pretty broad phrase, as many a law suit proves. But it's a good one to insist on. It will at least protect you against a flagrantly shoddy job.

Here are common first-year defects that you would be justified in demanding that your builder repair:

- Foundation cracks you can stick a pencil into. Such cracks are wider than would normally occur when foundation footings are properly laid.
- Cracks in concrete floors inside the house. They indicate that the builder made the floor too thin (it should be at least three inches) or that he laid it on dirt that has settled and no longer supports the concrete. Cracks that show up during the first year are often a sign of worse to come.
- Cracks wider than a pencil point in walls or ceilings.
- Exterior doors that warp so badly that you can see light through the side where it meets the jamb. These doors are a special problem. In winter one side may face zero weather, the other a cozy indoor 70 degrees. Even the best of them may

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pull out of shape slightly. Inferior ones will curve like the bow of a ship.

• Heavy buckling of wood flooring. The builder is advised to store wood flooring in the house for a few days at around 70 degrees before laying it. The idea is to give it time to adjust to prevailing humidity conditions. If the flooring is not right when laid, it may absorb humidity later, swell up, and buckle.

• Failure of your heating system to keep any room at 70 degrees on the coldest winter day. Convectors, radiators and registers usually need some adjustment after you move in. It's difficult for a heating man to set up a system that will give you the exact temperature you want in various rooms. (With automatic heating systems, you usually get free servicing for six months to a year. After that, you can buy a service contract for an annual fee—or learn to service the heating plant.)

• Wet-basement problems caused by water coming through the floor or walls. Sometimes holes in the cellar wall through which pipes pass may not have been cemented thoroughly. (If you're smart, you'll get your builder to guarantee that outside water won't seep into your basement.)

Don't panic. Many home buyers run to the builder with every first-year complaint. Some are justified. Ralph J. Johnson, director of the construction department of the National Association of Home Builders, says that buyers often don't realize that they are responsible for normal maintenance. Some builders spend "considerable sums" servicing minor items that customers should pay for. On the other hand, you have a right to expect the builder to repair serious troubles. An honest builder expects to do so. In figuring his price, he has considered reasonable fix-it costs.

You'll do better during the break-in period, though, if you don't pester him with every small complaint. If you don't want to make minor repairs yourself, wait until there are enough jobs to keep a workman busy for at least a couple of hours. Then put your request in writing, item by item, so that the builder can't forget them.

Getting through that first year may be tough at times, but take it easy and you'll enter your second year thoroughly housebroken—and liking it. END

Harden Your Own Tools? Now, It's a Simple Job

Using carburizing compounds now available, you can produce a fine example of casehardening

By John Burroughs

SUPPOSE for the moment that you're a tool-shop foreman, and a blueprint showing a special cutting tool comes from the engineering department. A note tells you to make the tool from *machine* steel and casehardening it. What would you think?

Ten years ago a toolmaker would have blown his top at engineers who lacked the common sense to specify *tool* steel for steel tools. Ten years ago casehardening—putting a hard shell on steel—was too time-consuming to be regular practice in small shops.

Not so today. With new hardening compounds you need only a few minutes to put a file-hard case on any ordinary steel—low-carbon or high, plain carbon or alloy. Equipment: a torch to heat the work red-hot.

If you're thinking that a casehardened tool won't compare with a similar tool made from tool steel, you're right. Anyone making a high-quality cutting tool picks top-grade steel, and carefully hardens and tempers it as the

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SMALL PARTS made of mild steel (screws, for instance) can also be given a hard surface with a casehardening compound. Pack the powder around the part in a container such as a pipe cap. Heat with a torch in a laid-together firebrick furnace.

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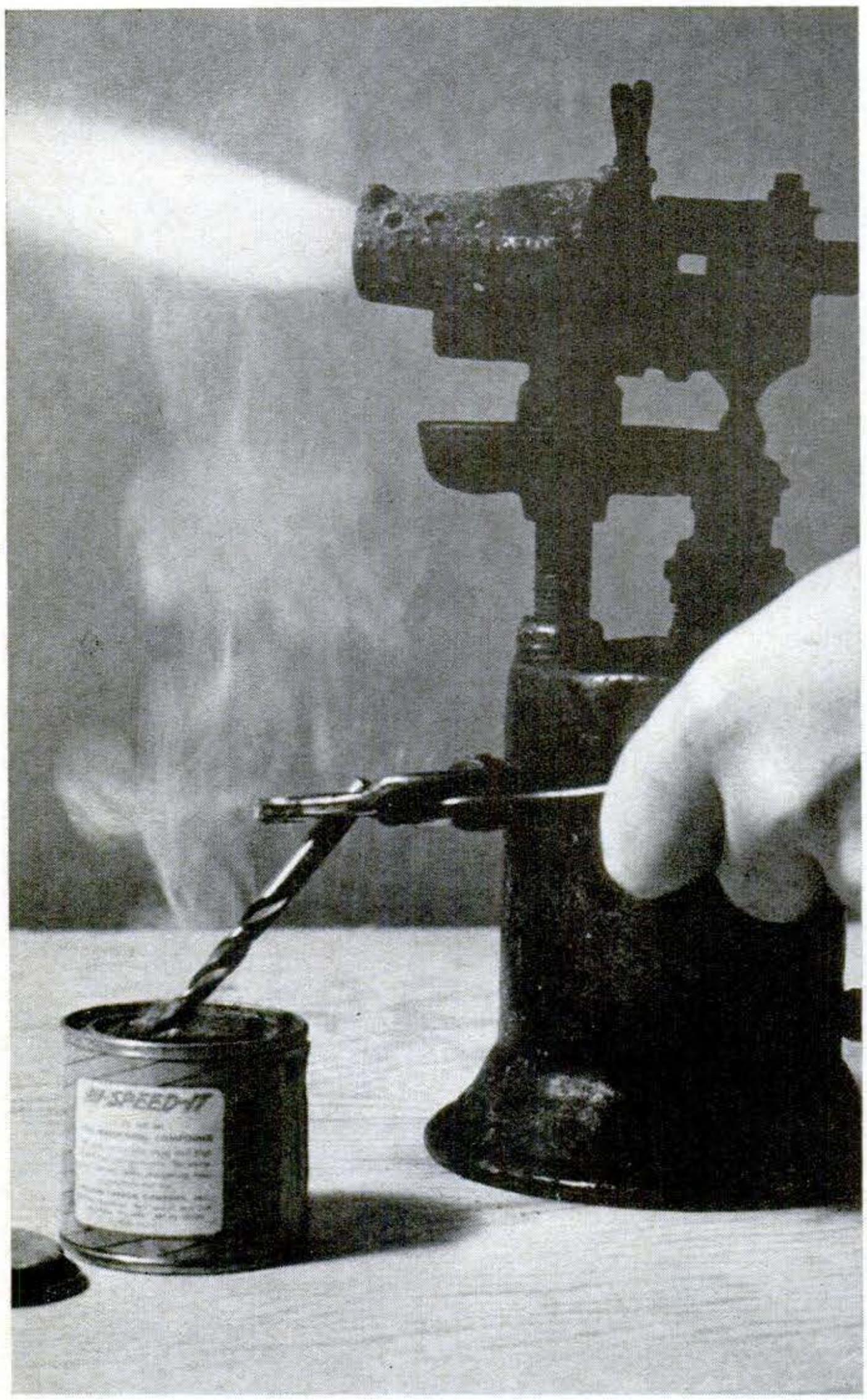
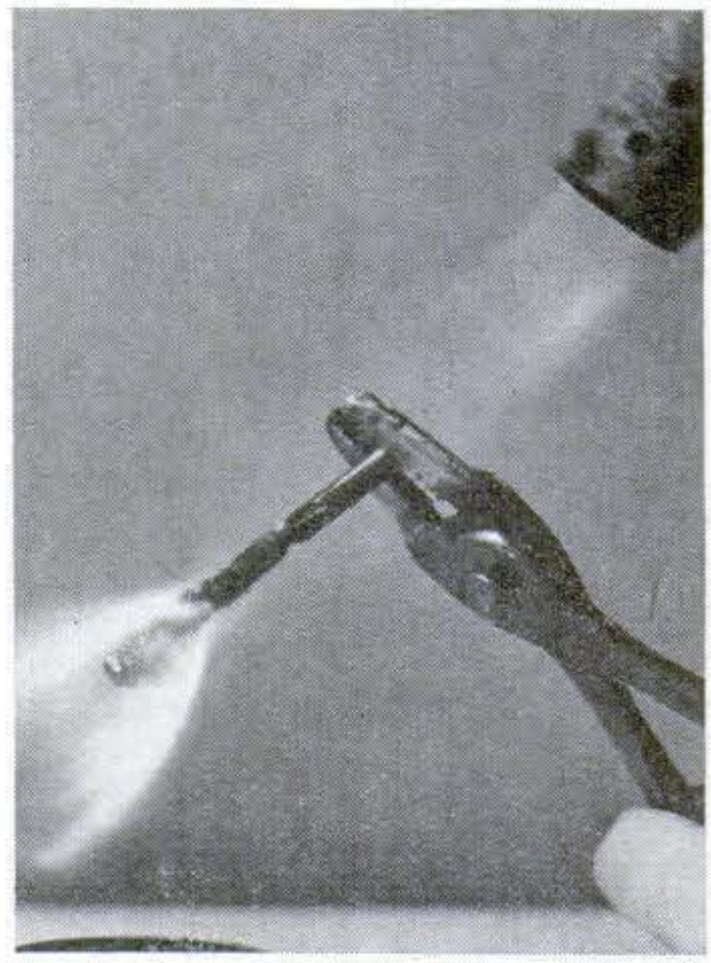
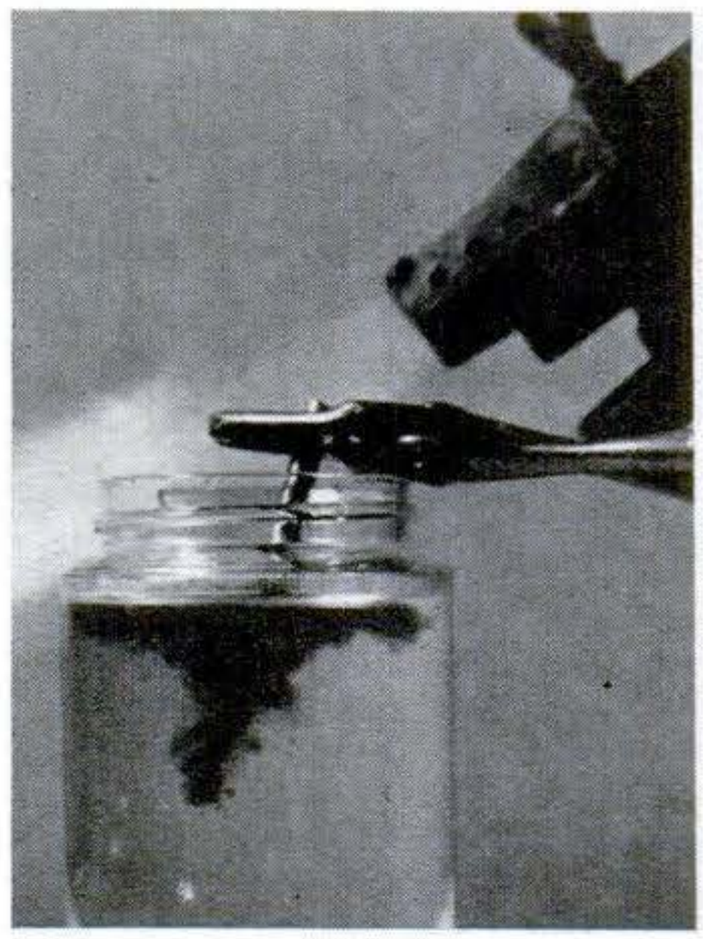
What you do to caseharden steel at home



1. HEAT METAL RED-HOT, bringing it up slowly to about 1,650 degrees F. in the flame of torch. Rub off any scale with wire brush or wad of steel wool. Then dip in carburizing compound.



2. REHEAT and dip in compound several times. Compound adhering to the steel will fuse and bubble, coloring the blue torch flame a brilliant orange. Hold at heat until a crust forms.



3. QUENCH in cold water or brine while still red-hot. This hardens the high-carbon case formed by the compound. Finally, it may be advisable to temper the work to relieve brittleness.

steelmaker recommends. But perhaps you just need some tool for one-time use.

Making your own tools. Suppose, for example, you discover you're short a $\frac{15}{32}''$ drill, or a special chisel or gouge, or a router bit, punch, graver, rotary file, end mill or shaped cutting bit—the sort of tool you use once in 10 years. Wouldn't a tool whacked from scrap—from a bolt, nail, angle or hunk of machine steel—and quickly casehardened be perfectly satisfactory?

Or suppose you're tapping a hole and break the tap, the only one that size you've got. If there's a can of casehardening compound on the shelf, you can groove the threads of a machine screw, and caseharden it. Your tap won't cut the close-tolerance threads you'd get using a regular tap, but it'll work.

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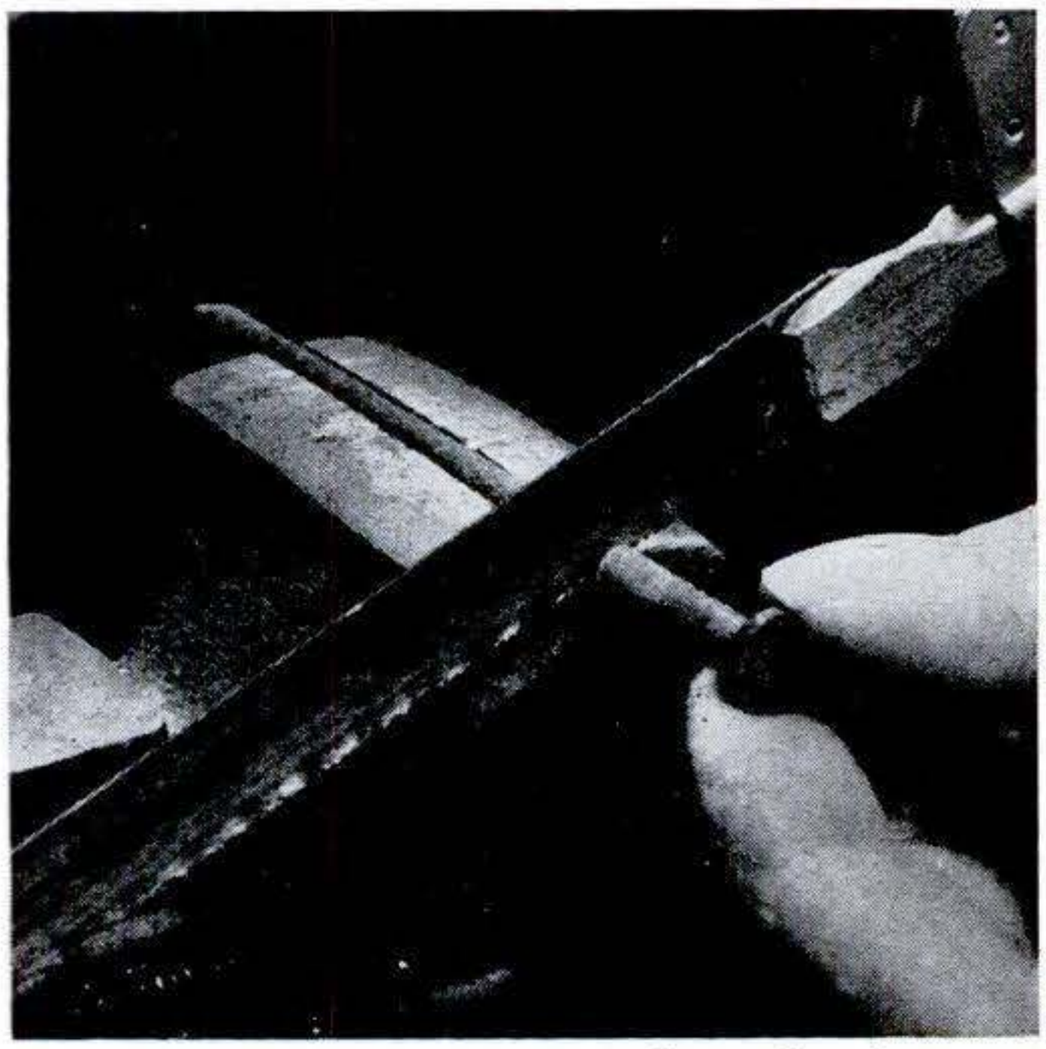
Two compounds are available, both in small-quantity package sizes. One, Kasenit, made by the Kasenit Co., Mahwah, N.J., is distributed nationwide through large hardware and machinist's supply houses. A pound can of Kasenit No. 1, recommended for hardening small tools, sells for $2.20.

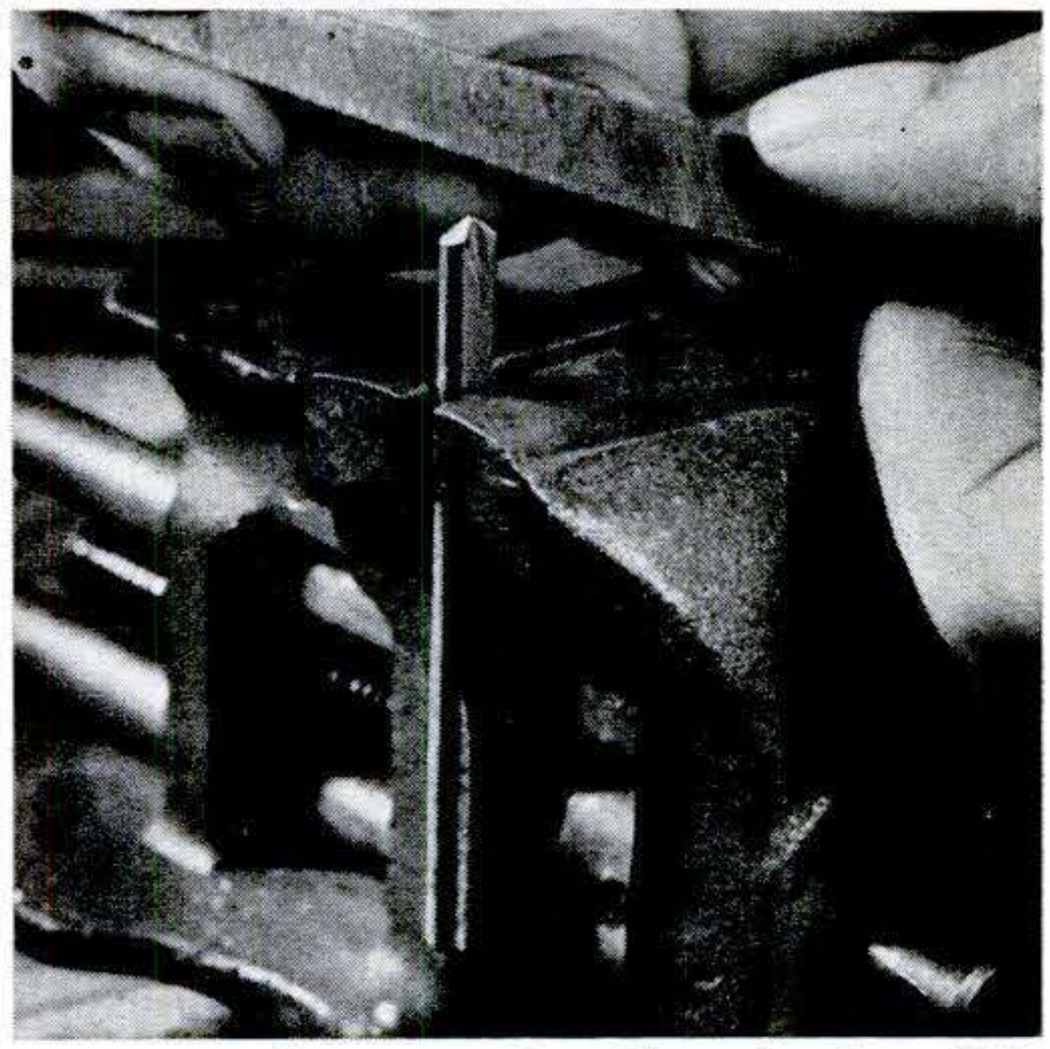
The other compound, trade-named Hi-Speed-It, is more expensive. A 2-oz. can costs $3, a 2-lb. can $20. Hi-Speed-It is not available through retail channels in the West, but Westerners can obtain it direct from the manufacturer (Wilson Carbon Company, 60 East 42nd Street, New York 17), who sends it postpaid to U. S. addresses.

The two products are used similarly. You simply heat the steel bright red (1,600 to 1,700°F.), roll the metal in the

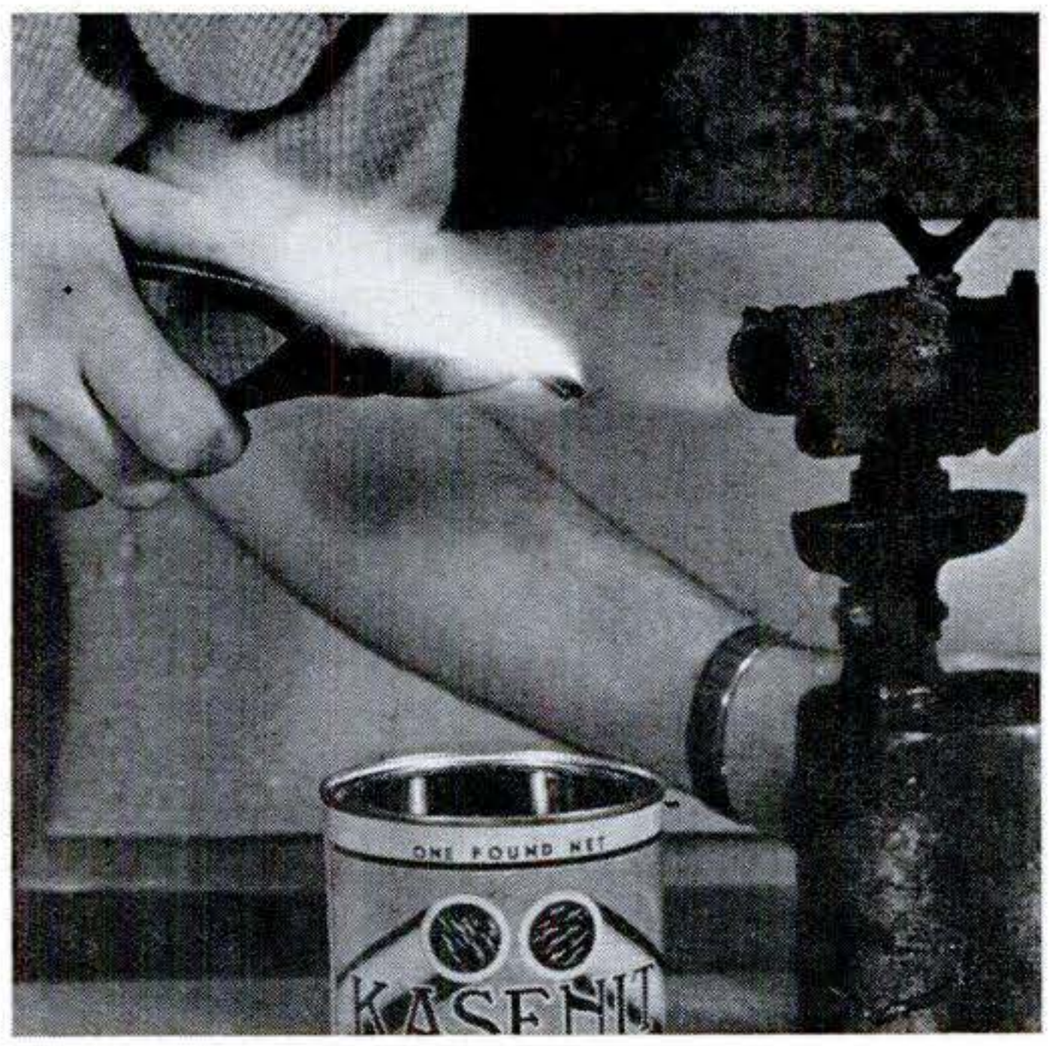
How to make a twist drill from an ordinary nail



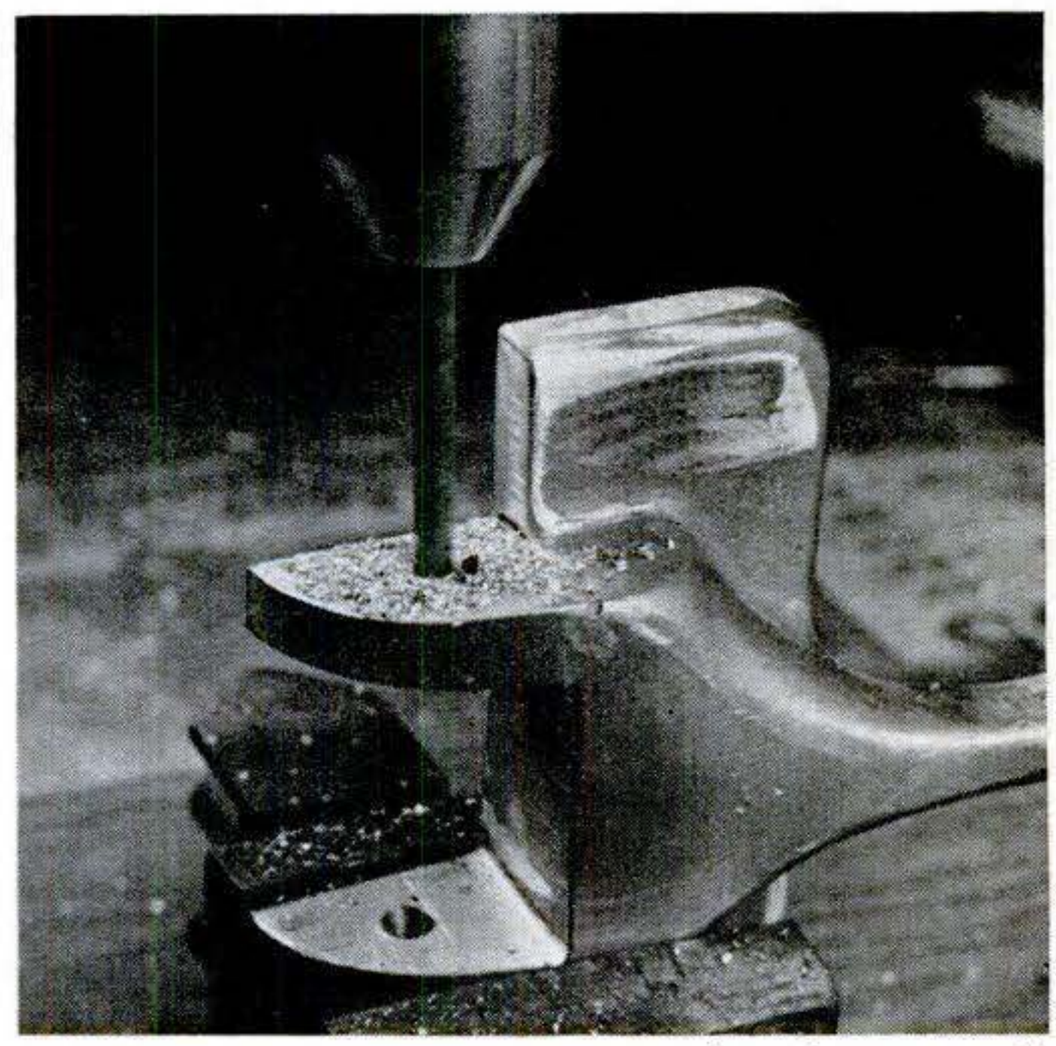
SMALL CUTTING TOOLS are easily made when you have a can of casehardening compound. For instance, by cutting off the head of an ordinary nail, you have the start of a twist drill.



FILE FLATS along opposite sides of nail and V-groove each flat at the point. Clamp nail end-up as above and shape two 59-degree cutting lips. Relieve the cutting edges slightly.



CASEHARDEN NAIL, fusing compound around the cutting lips and flats repeatedly for deep penetration. Quench the nail in water from a high red heat. Temper it if desired.



CHUCKED IN ELECTRIC DRILL, the former nail makes clean holes in an aluminum casting as above. You can also make reamers, countersinks, rotary files, routers and end mills.

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compound, then quench it in water. Repeating the process deepens the case.

How do these powders work? They're carburizing compounds. Carburizing is the age-old method of converting soft iron into hardenable steel.

Ancient smiths made steel in charcoal forges. The smith charged his forge with iron ore mixed with charcoal, and this mix, heated to yellow heat, became a blob of spongy metal. With continued heating the sponge-iron gradually absorbed carbon from the glowing charcoal. Time and again the smith would pull out the blob and smash it on his anvil to expose uncarburized metal, then return it to the forge. In time his wrought iron soaked up enough carbon (about one percent) to harden when quenched, becoming high-carbon steel.

Casehardening is the same story. Low-carbon steel—the stuff nails are made from—soaks up carbon when held at red heat in contact with carbonaceous material. The surface becomes hard.

Before fast-working compounds were developed, parts to be cased were packed into flasks of bone black and heated flask-and-all in a furnace. Another way was to cook the parts in a bath of molten sodium or potassium cyanide, a salt which at high temperatures will give up atoms of carbon. In the method commonly used in heavy industry, parts are heated in a retort filled with carbon- or nitrogen-bearing gases.

In all these methods free carbon atoms combined with iron in the steel to form hard iron carbides. But the action was slow. It took hours to diffuse enough carbon into the steel for a hard case.

There are other substances that will diffuse into hot steel when available in an active salt—nitrogen, chrome, boron, vanadium, titanium, for example.

Other elements, such as hydrogen, decarburize hot steel. For some reason, hydrogen attacks the iron-carbide crystals, or grains, along their boundaries, forming a network of microscopic cracks. These cracks, or fissures, are too small to appreciably weaken the steel.

What's in the compounds. With these facts in mind, imagine you're mixing your own carburizing compound. Begin with a carburizing ingredient, probably activated (spongy) mineral carbon. Add a lesser amount of decarburizing ingredient (a chemical that releases hydrogen when heated). Then mix in an assortment of metallic salts.

There's your compound. Now pick up a chunk of cold-rolled, heat it red-hot and roll it in the powder. Quench in water.

What happens? When you dip the hot steel into the compound, the black powder fuses and bubbles around the metal. Hydrogen from the decarburizing ingredient opens minute cracks along the grain boundaries, open avenues through which free carbon atoms supplied by the carburizing ingredient can penetrate. The metallic salts supply atoms of chrome, vanadium or other metal which combine with iron and carbon atoms to form complex alloy-like carbide crystals.

Tempering. A low-carbon-steel tool casehardened in compound and quenched in water is ready for use. Tempering—reheating to relieve brittleness—isn't necessary; the core of the tool, not hardened by the quench, serves as a shock-resistant support for the file-hard case.

High-carbon or alloy tool steel is another matter. When quenched from red heat, the core as well as the surface hardens, and your tool may shatter when used. It's preferable to quench only the tip or cutting edge, allowing the shank to cool more slowly and only half-harden.

Or you can temper a casehardened high-carbon-steel tool after quenching. Baking it in a kitchen oven for a half hour at 350°F. (changes in the structure of steel in tempering are a function of time as well as temperature) will relieve internal stresses without appreciably decreasing the hardness of the case. Set the oven at 440°F. to temper woodworking cutting tools. For impact tools use 500°F.

You can of course temper a casehardened tool with a torch, judging temperatures reached by the colors of the oxides that appear on steel as it's heated.

Because these compounds are largely salts, tools casehardened in them will rust in a hurry unless you keep them heavily oiled. The compounds caseharden stainless steels, but the treatment modifies the chrome carbides, and thereafter the steel may no longer be stainless.

But these are small disadvantages. For improvising tools in a small shop, a can of surface-hardening compound is wondrous stuff. It can save you many dollars in tool costs. END

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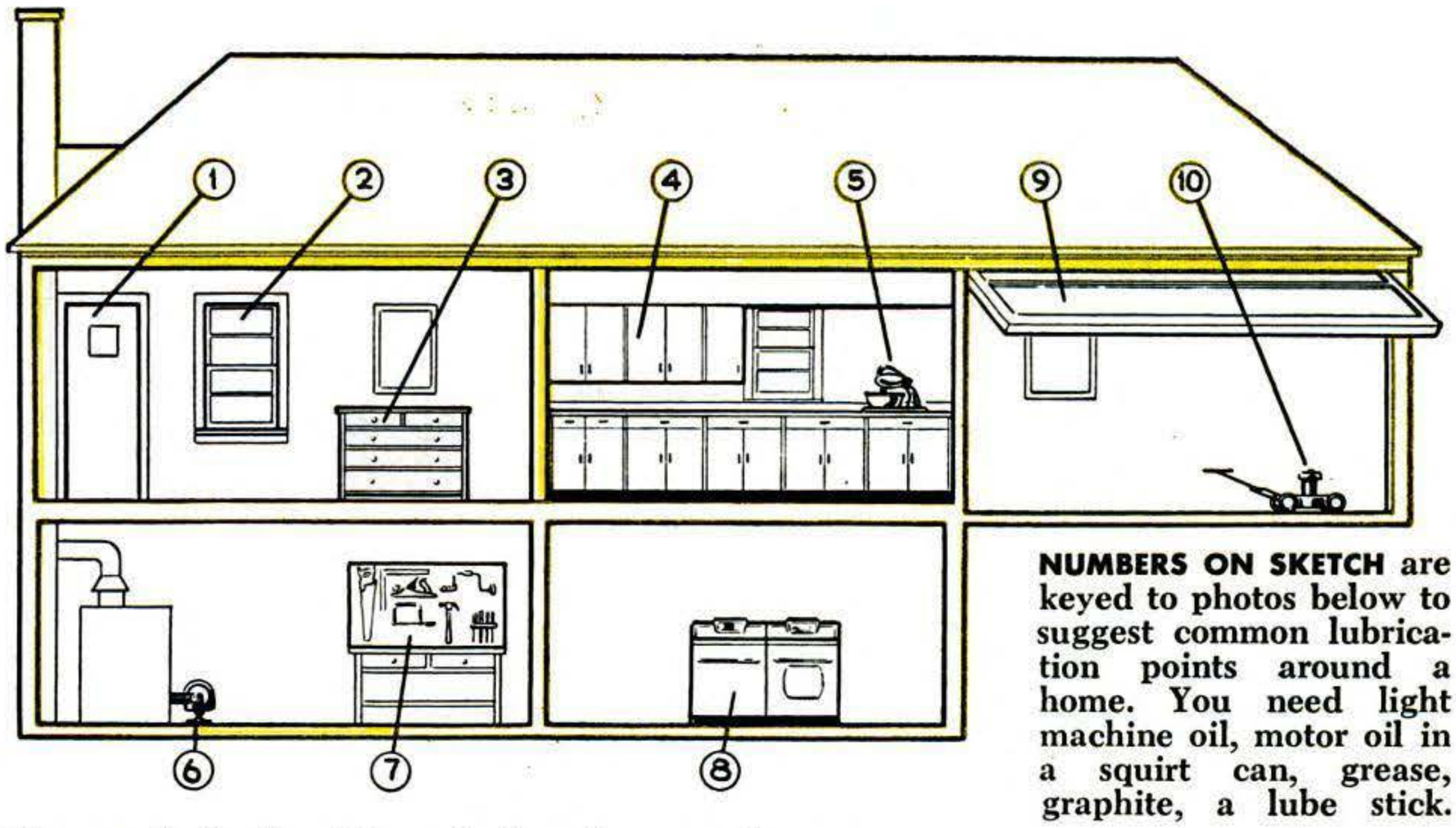
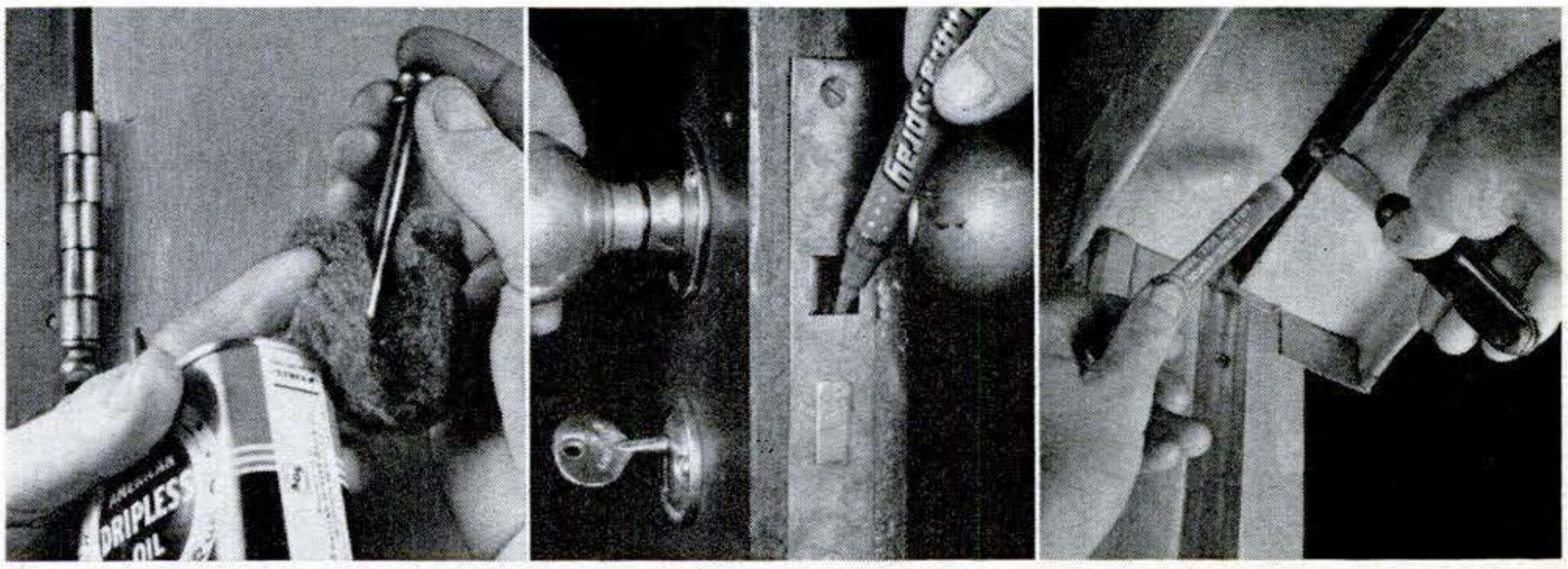
Lubrication Jobs

fix-it file

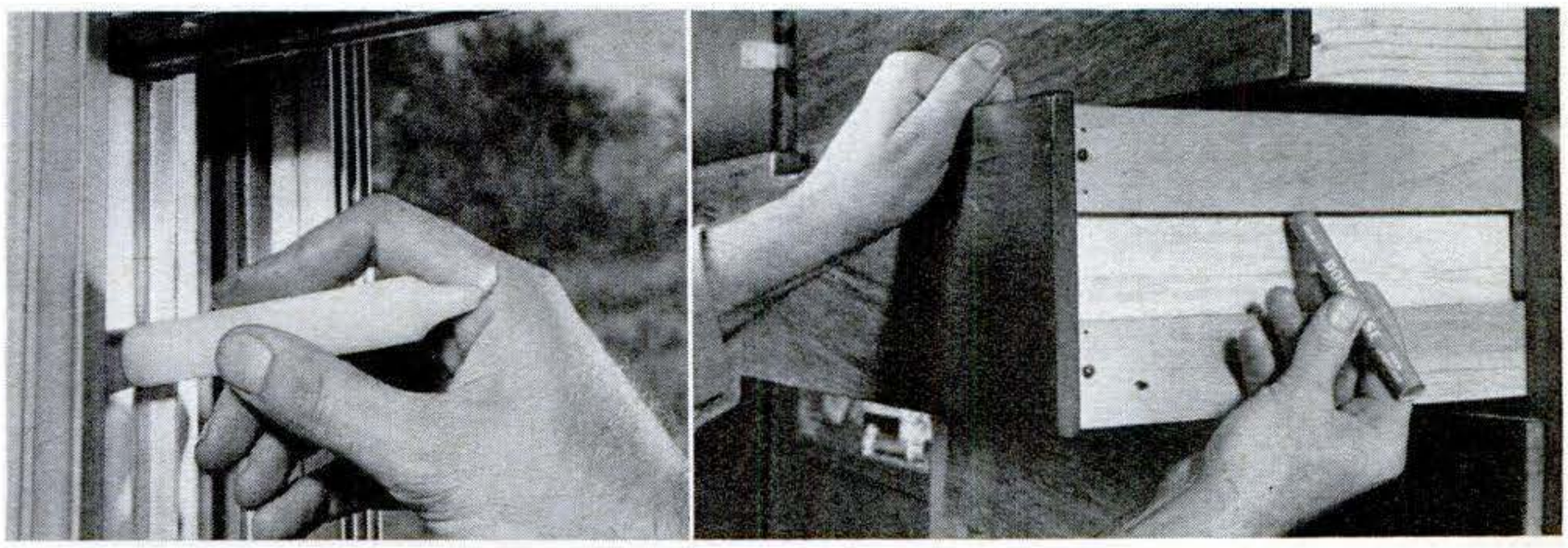


NUMBERS ON SKETCH are keyed to photos below to suggest common lubrication points around a home. You need light machine oil, motor oil in a squirt can, grease, graphite, a lube stick.

Three lubrication jobs in any house



1 DOORS that squeak or are hard to close will work with a new feel after you lubricate them. Take out the hinge pins (left), remove rust or old paint with steel wool, and oil them lightly before putting back. Puff powdered graphite or squirt light oil in latches while you turn them in and out (center). Rub stick lubricant on sliding doors and slip a pea-size bit in the track for the rollers to distribute (right).



2 WINDOWS will slide easier on lubricated jambs. Scrape off any paint that might be the cause of sticking, then rub stick lubricant, paraffin or a candle stub on the jambs.

3 DRAWERS that are stubborn will often respond to treatment with stick lubricant. Check first to see that the sliding parts aren't binding or that guides aren't loose.

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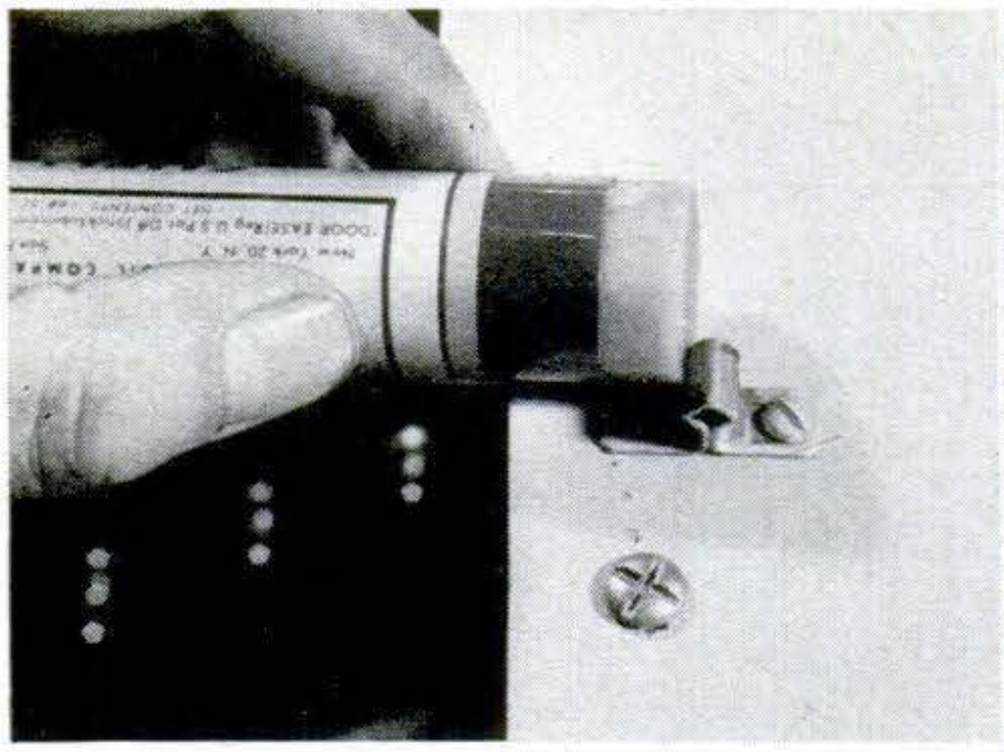
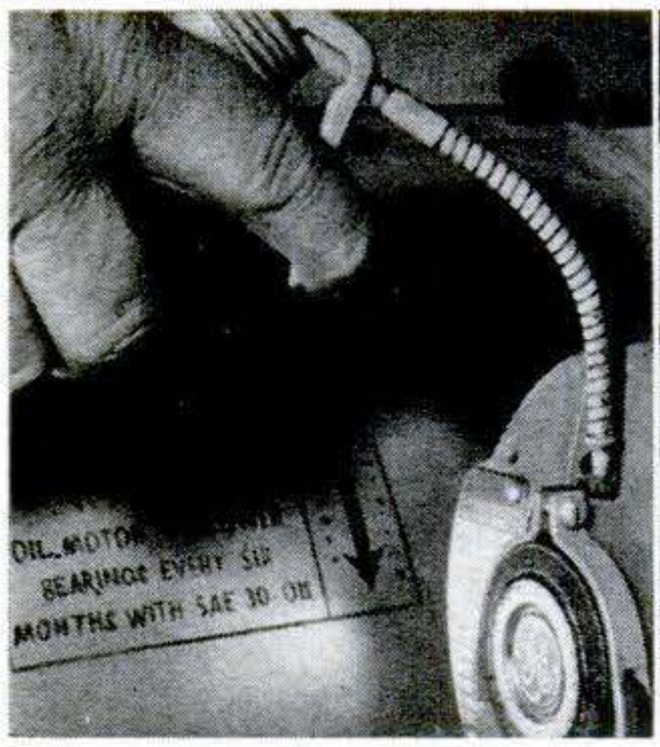
Lubrication jobs in the kitchen

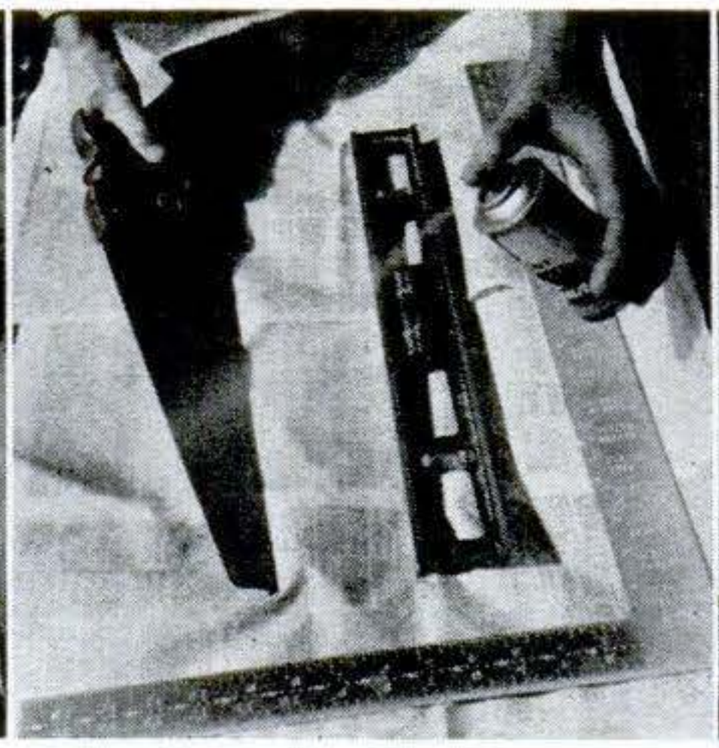


4 **FRICTION CATCHES** on cupboard doors will catch and release without effort if stick lubricant is applied to their meeting surfaces. Lube the bread-drawer cover, too.

5 **APPLIANCES** driven by light-duty motors need occasional oiling. Dribble one or two drops of light machine oil onto a broom straw to guide it into the tiny oil holes.

Lubrication jobs in the basement



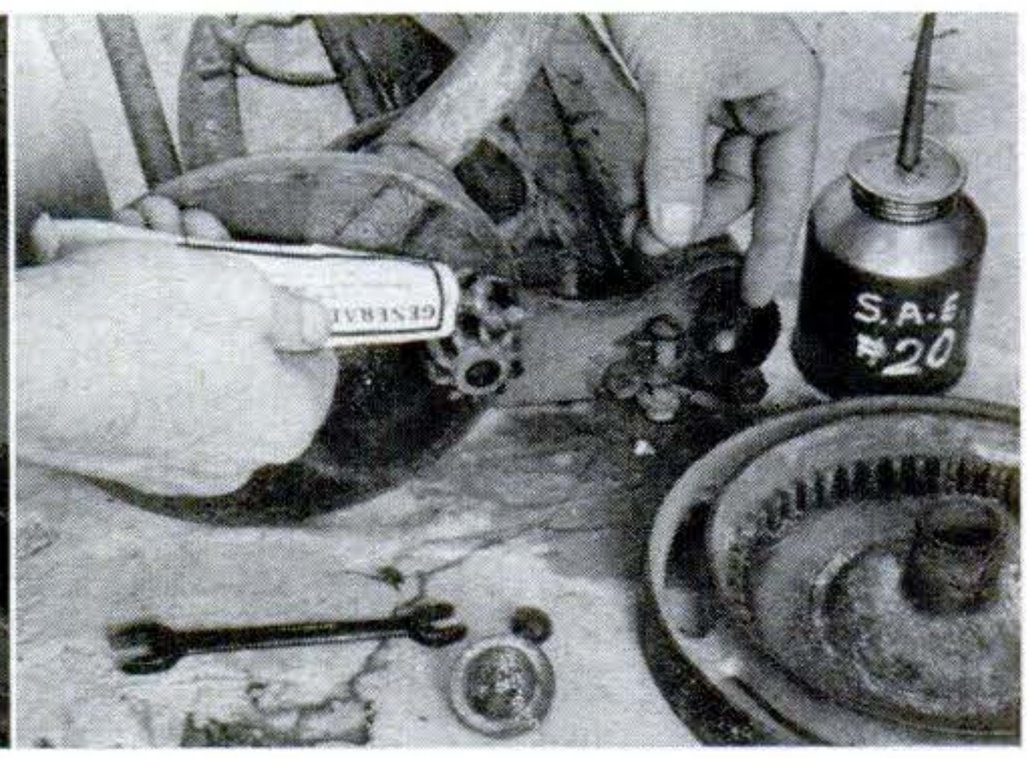


6 **OIL-BURNER MOTOR,** circulating pump or blower need only a few drops of No. 30 motor oil in oil cups twice a year. Don't overlube.

7 **WORKSHOP TOOLS** can be protected from rust with an aerosol oil spray. Lube power tools according to makers' instructions.

8 **WASHER** and other major appliances usually have factory-lubricated bearings. If there are oil cups, use No. 20 machine oil.

Lubrication jobs in the garage



9 **GARAGE-DOOR TRACKS** should be fed gobs of multipurpose grease, and the doors operated to spread it. Use heavy machine oil on rollers and spring-cable pulleys.

10 **LAWN-MOWER** gears are best lubricated with grease. Remove the wheels to apply. Put a drop of heavy oil on wheel bearings and cutter shaft each time it is used.

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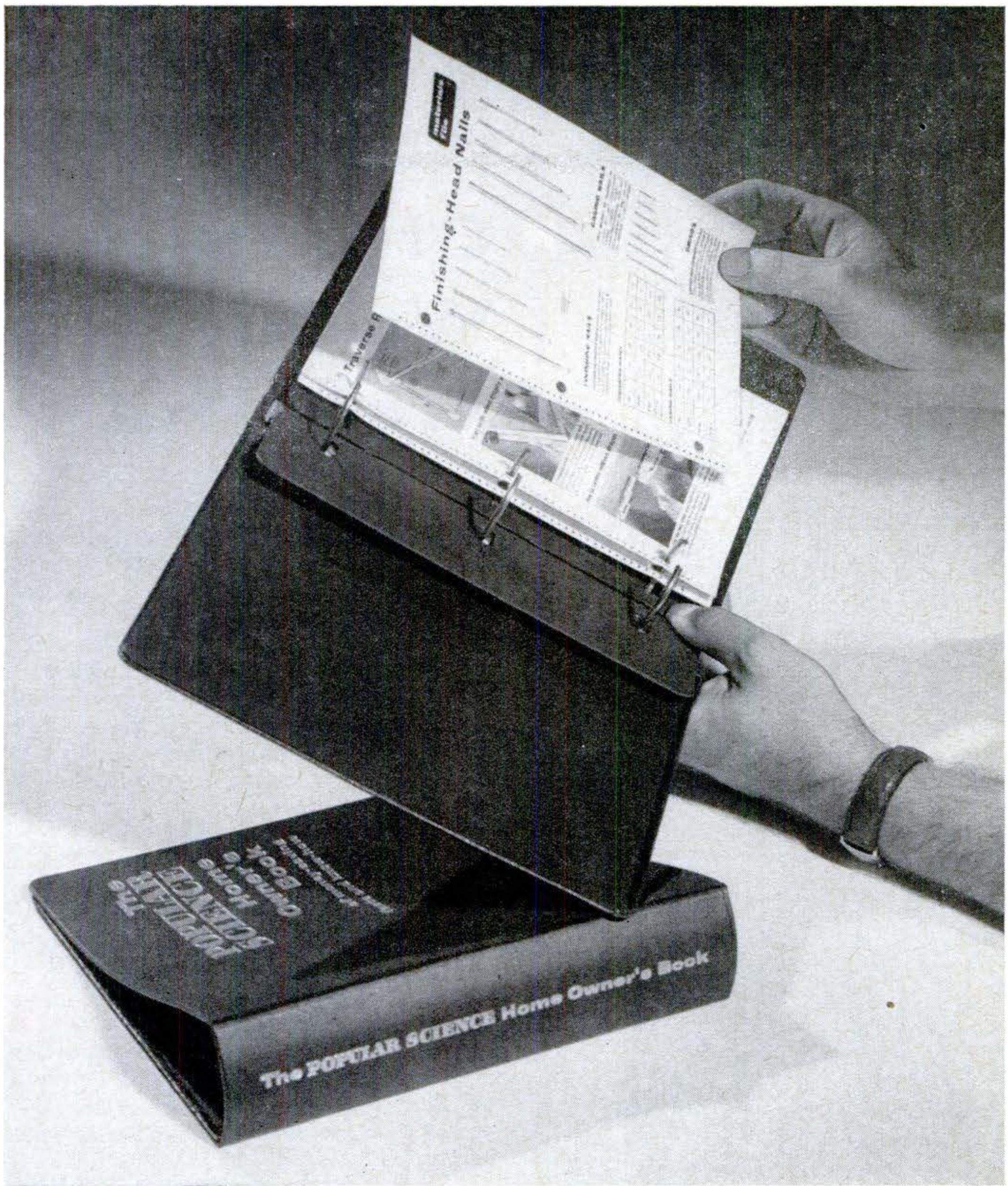

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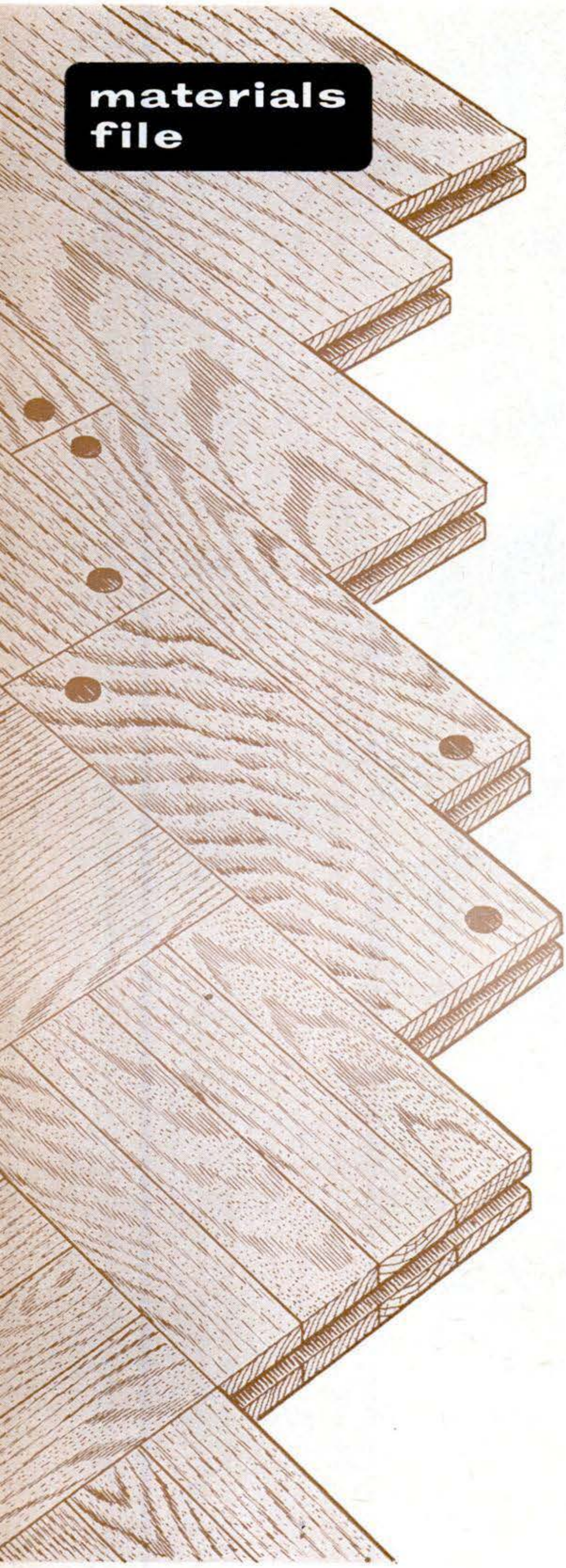

materials file

Remodeling your house? Building a new one? You'll profit from these money-saving pointers on

Choosing Wood Flooring

BEFORE you browse through your lumberyard—where the varieties, sizes and prices of wood flooring may both delight and distract you—ask yourself a few questions.

Where will you use the new flooring? Do you want it for a formal living room? Or an informal one? Will you cover it with wall-to-wall carpeting? Will it take a beating in a rumpus room? Should it be hardwood or softwood? And what style and type?

Hardwood or softwood?

IF YOU are economy-minded you may want to consider softwood in some rooms. But first, about hardwood:

The hardwood floorings are the tough, dense, heavy, long-wearing woods such as oak, maple, birch, beech and pecan. They account for about 80 percent of residential flooring in the United States. The reason is obvious: Hardwood floors wear better. The traditional guarantee for hardwood flooring is that it will last the life of the house.

Oak is by far the most extensively used hardwood, partly because it is plentiful and partly because people prefer its natural good looks.

Some 20 species of white and red oak are made into seven grades of flooring. The difference between white and red oak is not readily apparent. Both are light in color, but white oak has a brownish tinge, while red oak has a pink cast that usually turns reddish brown when finish is applied. Oak is the only popular flooring that is quarter-sawed in the better

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ONE GOOD WAY to buy flooring. The carton shown holds enough to cover 20 square feet. With five of them, you can do a 10′-by-10′ room without having to figure cutting waste.

grades to bring out the attractive wood rays or radial cells in the grain.

Maple is next to oak in popularity. It lacks some of the character of oak in grain, but it is very hard and strong, and has extremely high resistance to abrasion. For this reason it is often used widely in schools and public buildings where heavy wear is encountered.

Birch, beech and pecan have most of the characteristics of maple, but are used less extensively. Birch and beech are reddish in color, while pecan is darker than most woods used for flooring.

Softwood flooring such as pine, fir and hemlock is pretty hard, too, especially the edge-grain types. In general, however, these products of the conifers are lighter, softer, less durable and less stable dimensionally. Distribution of softwood flooring is apt to be on a regional basis. In the East, you'll find pine; in the West, fir. Overall, however, the amount of softwood used for residential flooring nowadays is quite small.

Because they usually are cheaper, softwoods are sometimes used in so-called budget housing. Then, too, softwoods are sometimes specified in high-cost houses, where it may be used to harmonize with similar wood paneling or to carry through a decorator's theme. Softwood is also easier to lay because the average length of strips is about 16 feet.

Where will you use it?

THE room in which you'll place the flooring will certainly have a bearing on your choice.

In the living room, you may want some high style; most folks do. So chances are you'll go for hardwood, probably oak, the handsomest of the hardwood tribe.

In a busy rumpus room, you'll need flooring that can take it—a floor that you can waltz or skate on. Here you may want to consider birch or maple.

If you plan to put down wall-to-wall carpeting—in any room in the house—why spend extra money for handsome flooring that will never be seen? You'll save by using softwood or a low-grade oak. However, top grade hardwood flooring can boost resale value of the house.

Choosing a style

WOOD flooring comes in four main forms—strip, plank, parquet and block. Each has its own characteristics and applications.

Strip is the most popular, although it has been losing ground to the wider plank, perhaps because buyers like the latter's casual charm.

Strip flooring produces a somewhat formal effect. This is sometimes lessened by using strips of different widths. Most strip flooring is tongued and grooved at the factory so that each piece locks snugly against its neighbor. But square-edge strips are available, too, for special applications.

Standard thicknesses for tongue-and-groove flooring are $\frac{3}{8}''$, $\frac{1}{2}''$ and $\frac{25}{32}''$. Widths range from 1″ to $3\frac{1}{2}''$. The most commonly used size is $\frac{25}{32}''$-by-$2\frac{1}{4}''$ tongue-and-groove with matching ends that lock together to make a completely integral

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floor—one that won't squeak or lift up.

Interesting patterns can be worked out simply by selecting stock with variations in color, or other natural irregularities. Strip is available in practically all the hardwoods and in several softwoods, depending on the region.

Plank flooring comes in widths from 3″ to 9″ and is almost exclusively oak. Wide planks are sometimes fastened with screws covered with plugs to simulate pegs; but generally, plank comes with plugs of contrasting wood already glued in place. Plank is most often laid in ranch and colonial homes, where it contributes to an atmosphere of rugged informality.

Tongue-and-groove plank is usually $\frac{25}{32}$″ thick and would resemble strip, except for the pegged ends and beveled edges that accent each plank.

Parquet is the most elaborate and expensive type of hardwood flooring. A true parquet floor consists of short, matched lengths, usually $\frac{25}{32}$″ by 2¼″, individually laid to produce interesting patterns such as herringbone, basket-weave, squares and rectangles. The pieces are customarily tongued-and-grooved and end-matched. Standard lengths are multiples of the widths to aid in laying out the pattern.

If you've a yen to be exclusive, an experienced craftsman can use oak, maple, beech, birch, walnut, mahogany, teak, cherry and ebonized (dyed) wood to lay parquet in an almost unlimited number of fascinating designs. But your bill will reflect the workmanship in such a floor.

Block flooring is a modern form of parquetry that gives the rich effect of individually laid strips, but at lower cost.

Blocks are made in the principal hardwoods in two forms: unit blocks and laminated blocks. Unit blocks are full-thickness hardwood *strips* joined together at the factory (sometimes with steel splines) to form squares and rectangles of various sizes. Laminated blocks are usually made by gluing *square* plies of hardwood together under pressure, like plywood. One brand has a center core of poplar, which is said to add dimensional stability. Laminated blocks are the only type recommended for radiant-heated floors.

Both types are made with tongue-and-groove edges and are frequently laid in mastic. Striking patterns are produced by laying blocks with the grain at right angles to surrounding blocks, or by contrasting light- and dark-colored blocks.

An economy tip: Lay blocks to form a border around inexpensive flooring that will be covered with standard-size rugs. This way, you'll have an attractive border, and the saving is under the rug.

What will it cost?

FLOORING costs vary with the wood, style, and your locality. A 12′-by-16′ room floored with a good grade of strip oak might cost you around $100. A parquet pattern with the same material could easily double the tab. Birch or a medium-grade oak for the same room might stand you $80, and you could lay down softwood or a low-grade oak for close to $40. Although prices range from $40 to over $200, you can *walk* on any of these floors.

Oak falls into all price ranges. The seven grades divide into three types: quarter-sawed grades, which are the fanciest and are labeled clear and select; plain-sawed grades—clear, select, No. 1 common and No. 2 common; and, at the bottom of the list, a grade called 1¼″ shorts, made from No. 1 or No. 2 common.

The average length of pieces in the better grades is 4¼′; in the lower grades, 2½′ to 3′. All grades have the same qualities of strength, insulation and resiliency. The only difference is in appearance. Cheaper grades have more sapwood, more knots and other deviations in the grain.

For pure economy, the cheaper grades of oak are a good bet. No. 2 common, which sells for less than softwoods in some areas, makes a sturdy floor for the bathroom or kitchen, where a final covering such as tile or linoleum will be installed. This grade is also recommended for flooring attics. The 1¼″ shorts are fine for closets, alcoves and other small areas.

If you're remodeling—covering over a worn or ugly floor—you can save by using the thinnest flooring available in the style and wood of your choice. The old floor will provide a sturdy base for the new one, so there's no need for thicker flooring for more strength. The thinner stock won't noticeably raise the level of the floor, and simply raising the

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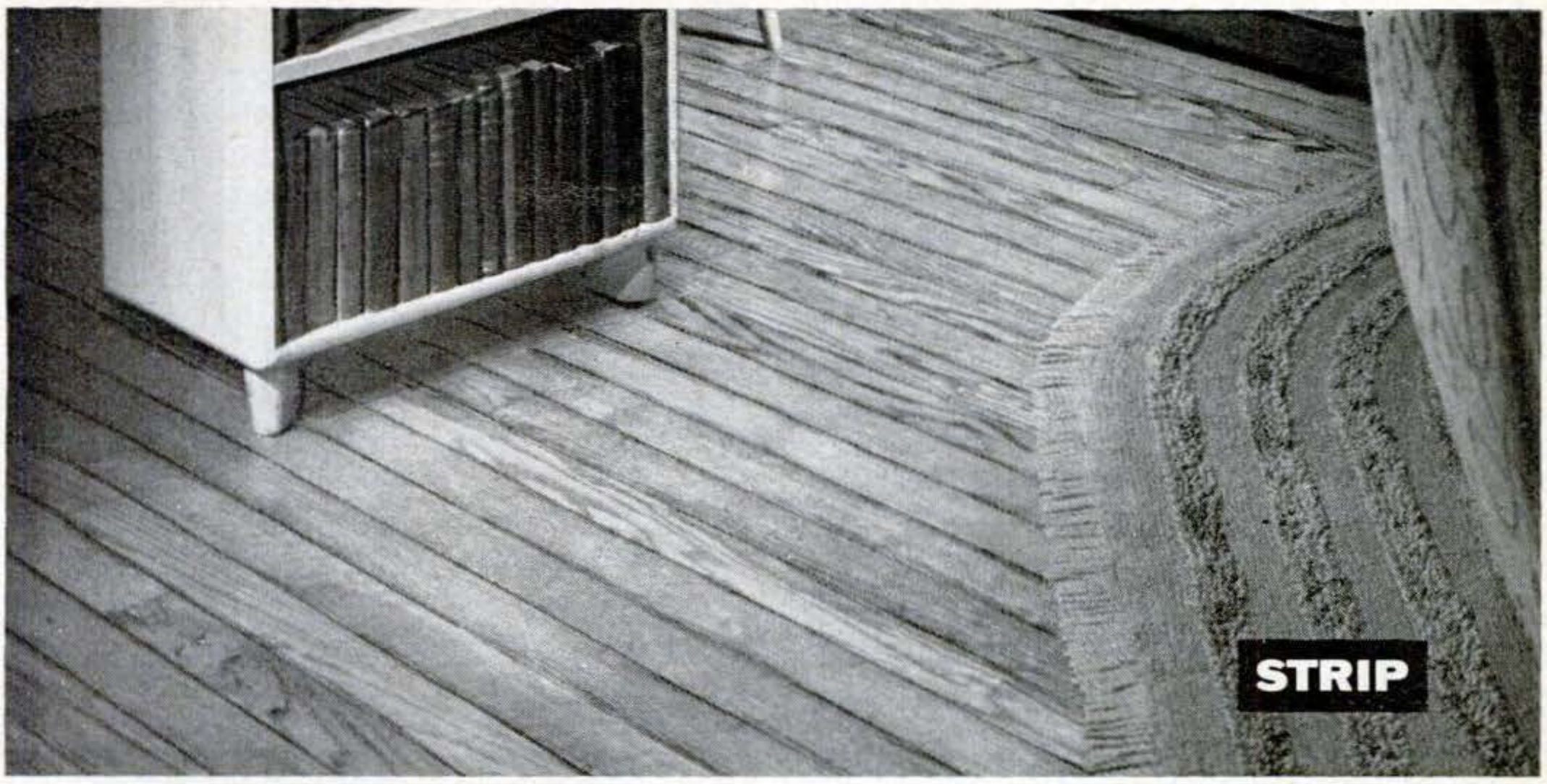
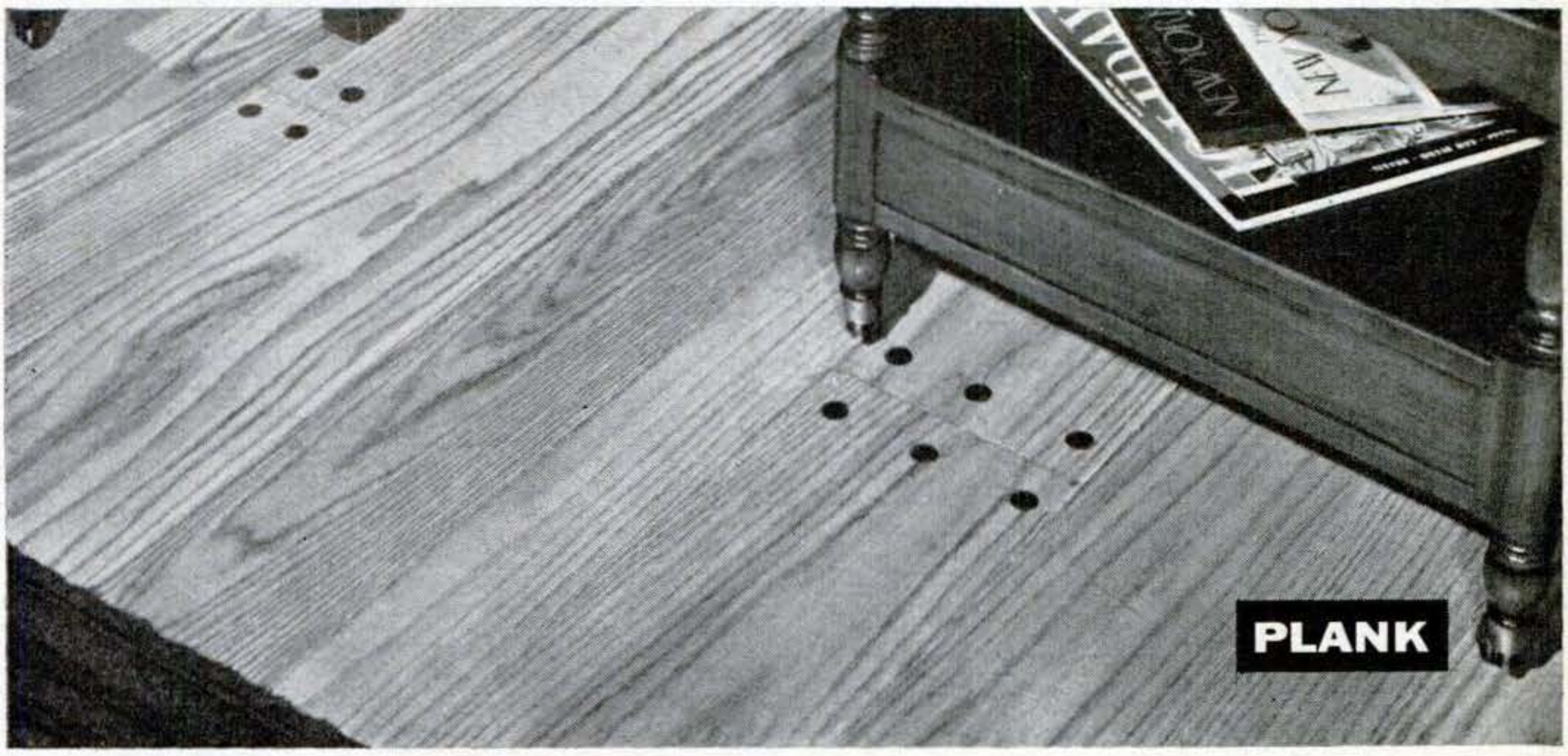
These are the three popular flooring styles





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baseboards a bit will accommodate it. All the rules of new flooring apply to your selection of a floor to go *over* an old one.

What about prefinished flooring?

BEFORE you decide on raw wood, look into the advantages of prefinished flooring. Finished at the factory under ideal conditions, it comes to you with a smooth, hard surface that probably will outlast a brushed-on finish applied on the job. Some suppliers *bake* on the finish.

Prefinished flooring is produced in several grades. Strip, plank, parquet, and block all come prefinished. The cost of prefinished flooring is higher than raw wood, but the difference shrinks when you add finishing costs to raw-wood price.

For remodeling, you can't beat prefinished flooring. It's ready to walk on when the last nail is driven home and there's no dust from sanding to drift over the furniture and moldings.

How to order flooring

IN COMPUTING the board feet of strip or plank flooring needed for an area, certain percentages must be added to the square footage to be covered. This is because the tongue of each piece is included in the measurement to determine board footage, but actually does not occupy surface width since it fits into the groove of the next piece.

Percentages added vary with the flooring size. Dealers have a chart on this. With 2¼" flooring, you add 38⅓ percent. This includes five percent waste.

To eliminate confusion, some suppliers pack flooring in cartons or in prefigured bundles marked to cover a specified area. The waste element is calculated and enough material is included to cover the square footage shown on the package. A professional may resent having his figuring done for him in this way, but the square-foot bundles are a big help if you're doing the job yourself. END

HARDWOOD FLOORING: *Sizes and Thicknesses*

In every style, a few sizes become popular and are used extensively. The wide range of sizes given below illustrates the variety available, but it's doubtful if any dealer carries a stock of all sizes.

WOOD	STRIP	PLANK	PARQUET	BLOCK		
Oak	square edge: 5/16" x 1½" 5/16" x 2"	square edge: 5/16" x 3" to 9" (random)	tongue & groove: 25/32" x 2¼" in lengths: 6¾" 9" 11¼" 13½" 15¾" 18"	tongue & groove laminated block: ½" x 9" square 25/32" x 9" square		
	tongue & groove: ⅜" x 1½" ⅜" x 2" ½" x 1½" ½" x 2" 25/32" x 1½" 25/32" x 2" 25/32" x 2¼" 25/32" x 3¼"	tongue & groove: 25/32" x 3" to 9" (random)		tongue & groove unit block:		
				width of strips	½"-thick block	25/32"-thick block
			1½", 2" and 3" widths available on special order	1½"	7½" x 7½" 9" x 9" 6" x 12"	7½" x 7½" 9" x 9" 6" x 12"
				2"	8" x 8" 10" x 10" 6" x 12"	8" x 8" 10" x 10" 6" x 12"
				2¼"	— — — —	6¾" x 6¾" 9" x 9" 11¼" x 11¼" 6¾" x 13½"
				3¼"	—	6½" x 13"
Maple Beech Birch Pecan	most sizes listed above	not made	most sizes listed above; also comes in teak, walnut, cherry and mahogany	laminated block not made; unit block in most sizes listed above; also comes in walnut and blended woods		

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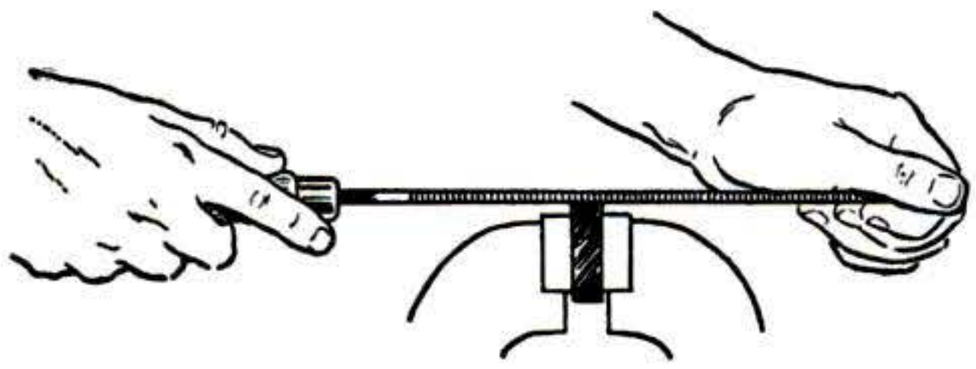
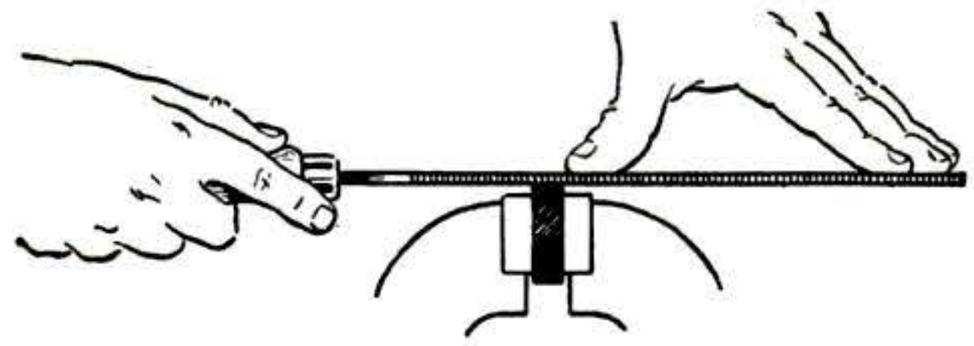
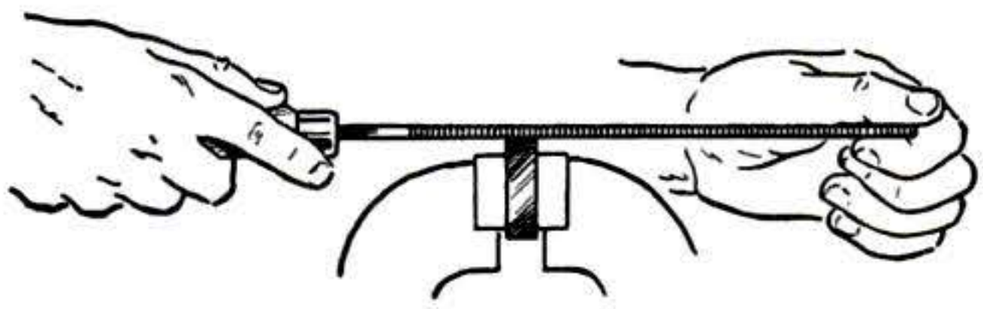


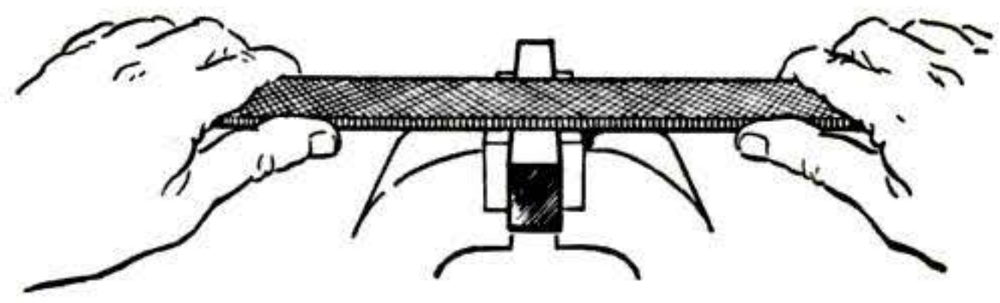
1. To remove metal fast



2. For medium-pressure cutting



3. For precise surfacing



4. For draw filing

FOUR WAYS OF HOLDING A FILE for different jobs are sketched above. In each of the first three ways shown, you should cradle the handle of the file in the palm of your right hand.

How to Use a File

IDEALLY, the surface you are filing should be at elbow level when your arm is bent. Uphill or downhill filing makes it difficult to stroke the tool accurately and produce a surface that is either completely flat or uniformly curved.

If you're right-handed, plant your left foot about 24 inches ahead of your right. (Southpaws reverse the stance.)

Holding the file. Cradle the handle in your right palm with your thumb resting on the top and your index finger along the side. This lets you keep the file level while applying weight to the forward end at the beginning of each stroke, to both ends of the file at the middle of the stroke, and to the handle as you conclude the stroke.

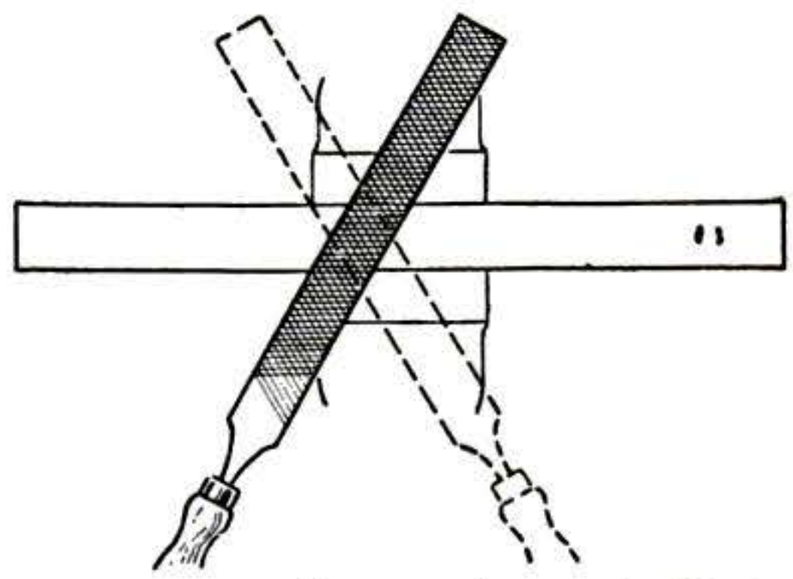
1. To remove large quantities of material quickly with a coarse file, grip its forward end as in sketch above. This way you can apply maximum downward pressure with the heel of your hand.

2. For accurate medium-pressure work, stretch your thumb and fingers wide apart to distribute weight evenly along the file. With this method you can feel unevenness in the metal you are filing and use the full length of the file.

3. For very precise surfacing with small files, hold the tip of the file between your thumb and index finger.

4. Draw filing finishes a job, and this shows how to hold the file (one with very fine teeth). Draw and push it along the surface with even pressure. The burr that will form along each edge should be removed with a few light, angled strokes of the file.

Use the right stroke. Don't seesaw the file. Keep your body stationary and let your arms pivot from the shoulders. When working on narrow surfaces, hold the file diagonally and stroke forward and sideways at the same time, reversing the diagonal and transverse direction of the strokes frequently. Because the file teeth face forward, exert pressure only on the forward strokes. During return strokes let the file glide across the surface of the work.



REVERSE THE FILE frequently as indicated for diagonal strokes across a narrow surface.

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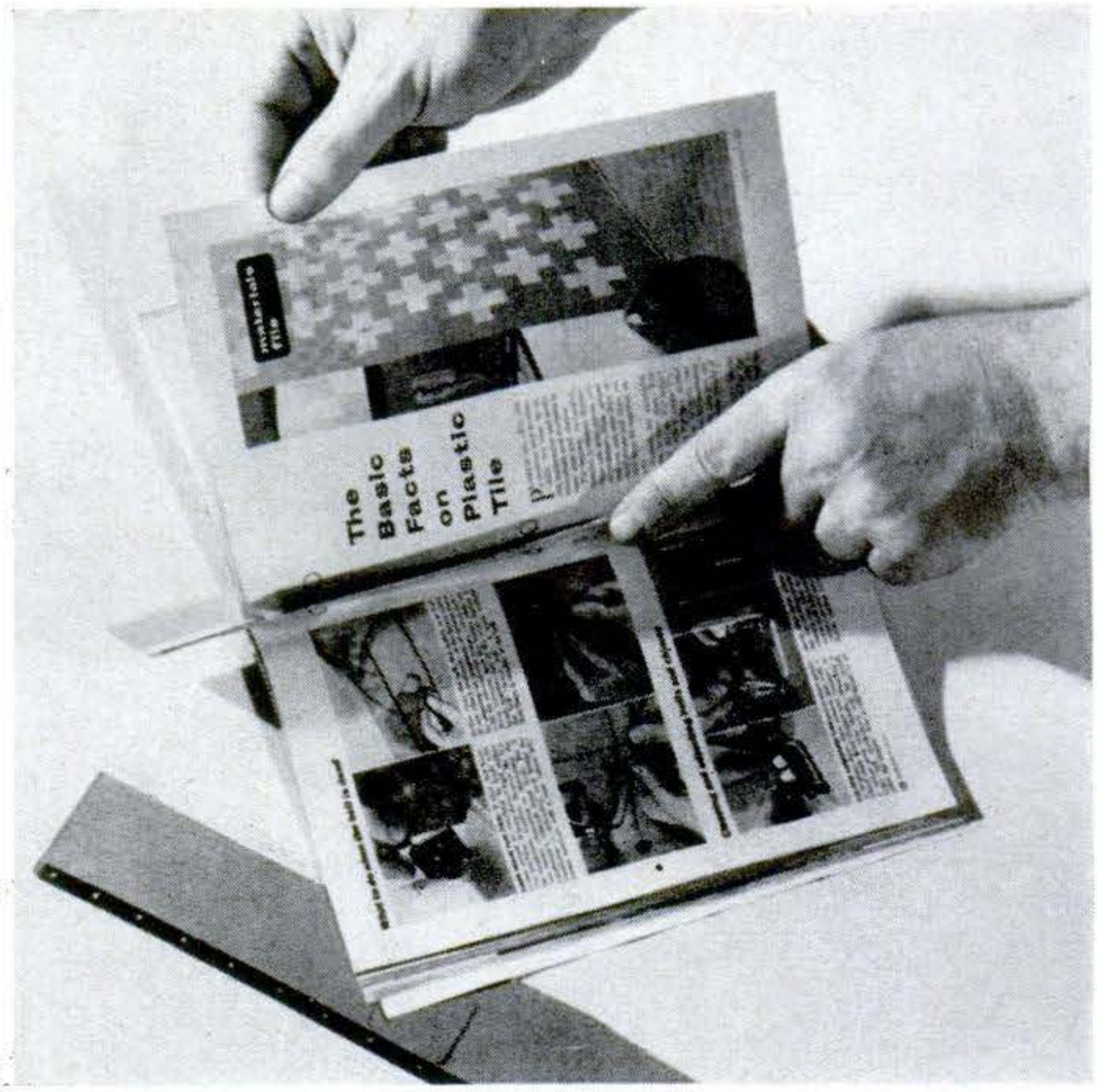
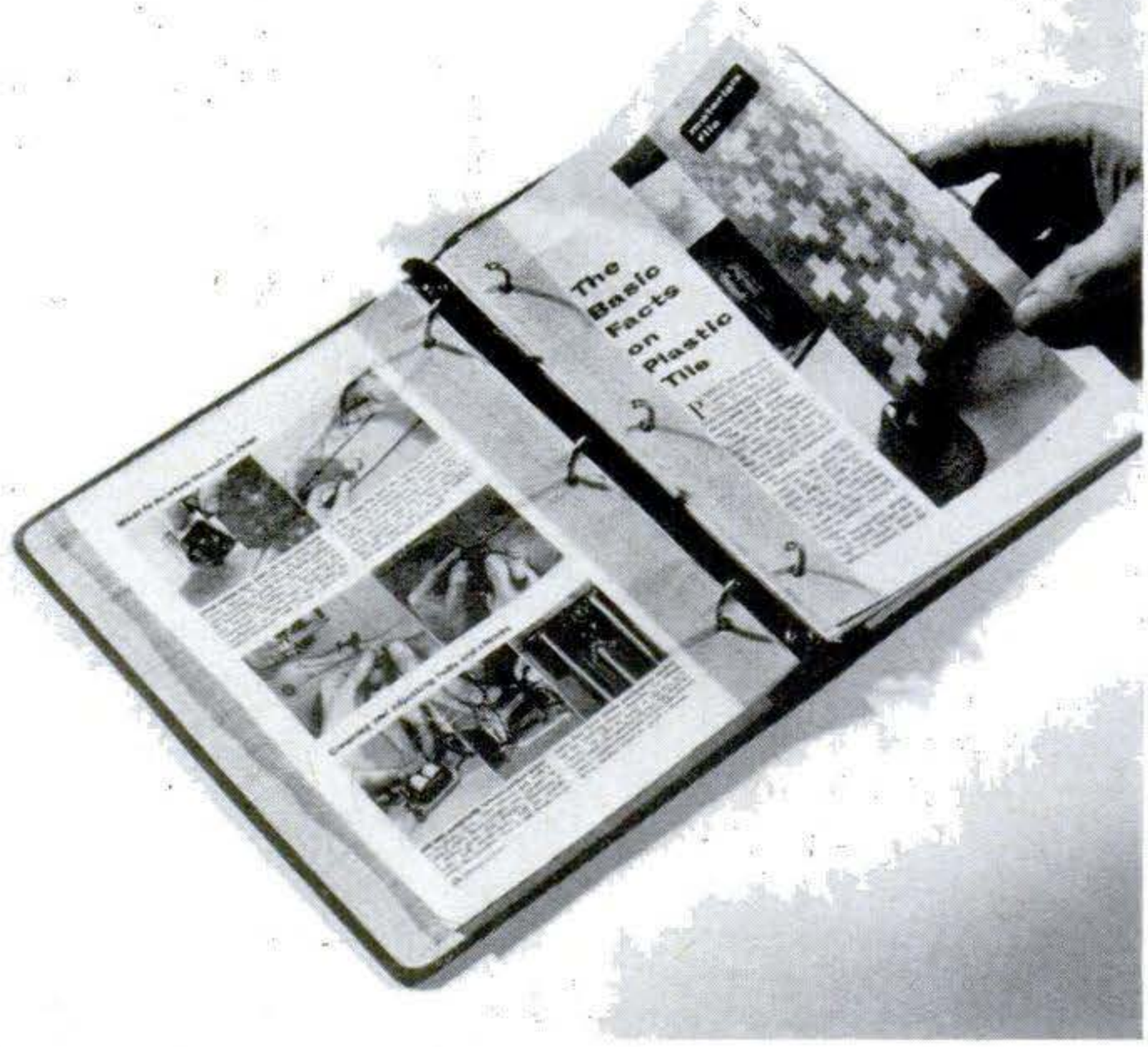
Easy-Tear-Out Tool Clips Fact Pages

SAVE the front from a box of waxed paper or aluminum foil. Its metal cutting edge can help you tear out PS pages close to the binding, making a neat edge.

If you're right-handed, shove the tear-out tool into the binding with your left hand and tear out the page with the right. The page you want should be on the right as the magazine lies open. For a page in the back half of the magazine, turn the text upside down so the bulk of the magazine is beneath your right hand as you tear. Southpaws, of course, follow this same procedure in reverse.



How to Reinforce the Edges of Those PS Reference Pages



AFTER you tear out fact-file pages for saving in the special POPULAR SCIENCE loose-leaf binder, it helps to strengthen the edges with tough masking tape.

Sandwich the cut edge of each page between two strips of tape. Let half the width of each strip extend beyond the page edge and punch holes in this part.

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Which Antifreeze Should You Use?

Before filling up for the winter, better review the latest pros and cons of the two common types

By Edward D. Fales Jr.

WHAT most of us know about antifreeze is accumulated hearsay. The chances are it's 90 percent wrong. False tips and rumors about antifreeze may actually be costing you money. Worse, they may be setting you up for a whopping repair bill.

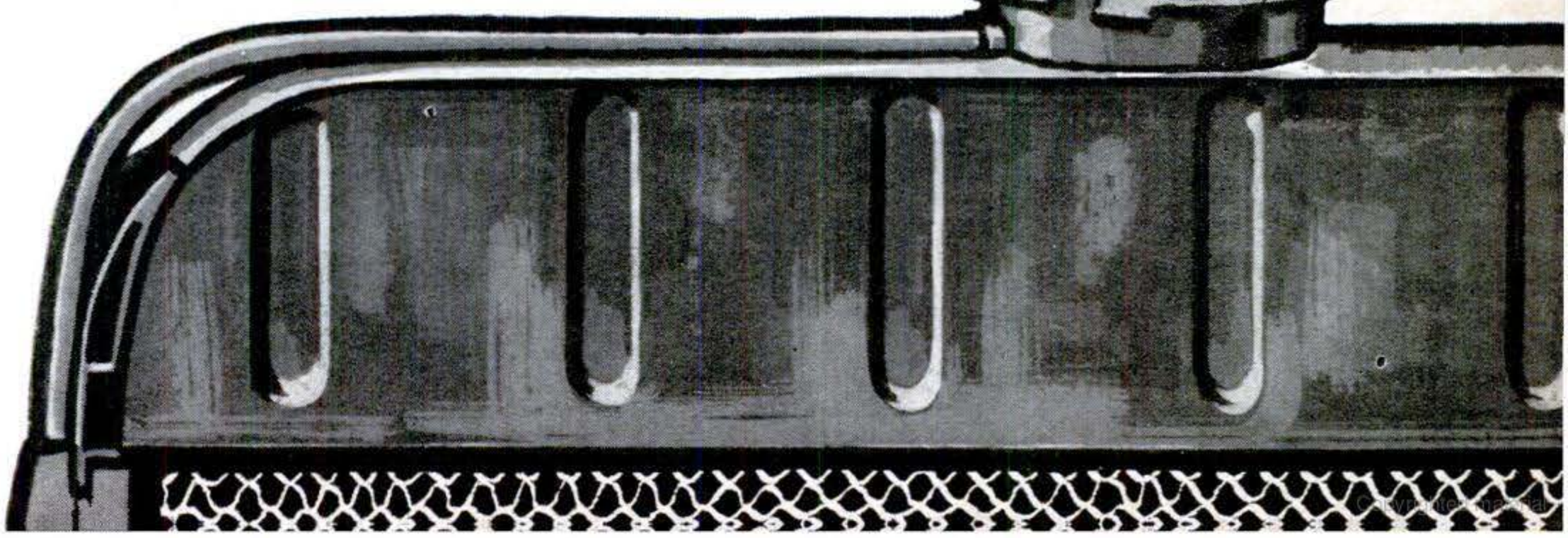
This year, before the first nip of frost sets in, you should ask yourself two questions. If the answers come easy, better ask whether they're right.

- Is it smart to use last year's antifreeze over again?
- Should you buy ethylene glycol (permanent) antifreeze or save money with the methanol (alcohol) type?

But is it permanent? Manufacturers of ethylene glycol wince when confronted with this word, which was featured in their advertising for many years. They have since put considerable effort into trying to disabuse the auto-using public of the idea that you can put it in and forget it.

Today, auto engineers, practically all auto manufacturers, U.S. Army Ordnance, the SAE, AAA and the National Bureau of Standards cautiously join them in advising you to throw away last year's antifreeze for the sake of your engine.

Glycol has become more popular than ever despite its higher cost. As for alcohol, you may be surprised to hear that under conditions favorable to its use, a properly kept cooling system will lose no more methanol than it will glycol,



and that this type of antifreeze in the right circumstances can be a safe, money-saving buy. But not always.

It's more important than ever to know the facts about what you put into the radiator to keep Jack Frost at bay. Today's cooling system is a highly efficient, hard-working one—and for that very reason more vulnerable than yesterday's. As much as 7,500 gallons per hour may circulate in the system, racing through some passages at 20 m.p.h., to keep the engine at safe operating temperature. Anything that slows it down even in one spot can damage a fine power plant.

7 steps for putting in new antifreeze

1. Drain the system thoroughly. Remember to open the engine-block drain plug or plugs, as well as the radiator petcock, or you'll leave old coolant in the block. Most sixes have a single drain in the block; V-8, one for each cylinder bank.

2. Flush and use a cleaner if the first flushing water shows discoloration or deposits. After using cleaner drain the system and flush again.

3. Replace hoses that are more than two years old, excessively hard, or soft and spongy. Check all the hoses, including those to transmission-oil coolers and underseat heaters.

4. Add the antifreeze after you have put in about a gallon of water. Avoid hard or impure water; rain water is ideal if clean.

5. Run the engine—after opening the heater valve—until it reaches driving temperature. If necessary, add water just below the level of the overflow pipe. (Warmup is necessary to open thermostat and send water through the system.)

6. Avoid under- or overfilling the radiator. The first allows air to enter the coolant, the second wastes coolant via the overflow.

7. Tag the radiator, showing the kind, brand and quantity of antifreeze used. Don't mix brands even of the same type. The inhibitors may be incompatible.

With older, less critical cooling systems you might trade off a car in time to let somebody else inherit the repair bills. Today—whether you trade in three years or five—a badly maintained cooling system may still nick you for repairs.

How do you play safe? You hear many conflicting opinions about the two kinds of antifreeze, their re-use, and their disadvantages. For instance:

"I've heard that leaving last winter's antifreeze in is like pouring acid into the engine."

"Throw away my ethylene glycol? That's just a sales pitch. My '48 car still runs fine with the original glycol in it."

"Farmers out my way leave in the permanent kind of antifreeze for five years."

"I wouldn't trust alcohol. It evaporates and then you have water left, which can freeze and crack the engine block."

"Nobody I know has ever seen a methanol fire."

"With ethylene glycol you need a higher-octane gas."

These are actual quotes, from car owners who think they know. Auto dealers are equally contradictory:

"Glycol can turn acid and if it gets into your crankcase you're in trouble."

"Detroit is putting ethylene glycol into new cars just off the line. That must prove it's better."

Your own car manual probably okays both types. You hear that some top experts in the coolant industry use glycol. Then you hear that others prefer methanol. (Both reports are true.)

What then are the facts?

The facts about ethylene glycol

THIS chemical is a clear liquid that won't burn when mixed with water, won't damage paint, and can stand higher temperatures in your radiator than can alcohol. Its own boiling point is a high 387° F. Mixed with water to protect down to zero, it boils at about 221°. If your car has a seven-pound pressure cap, the mixture will boil at about 238°. (Each pound of pressure raises the boiling point about 2.5°.) As you add more glycol, the boiling point goes even higher.

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You may have heard that ethylene glycol tends to leak or seep out more readily than water or alcohol. This is more apparent than true: A glycol leak does not evaporate as fast, so the leak stays damp and shows. Also, the dye in the antifreeze marks the spot conspicuously, whereas water leaves no trace. Finally, water costs nothing, so a water leak ignored as trivial becomes painfully evident to the pocketbook when it oozes glycol.

With any good brand of glycol, seepage is no problem if the cooling system is as watertight as it should be. Hose clamps, which routinely loosen as hoses soften, shrink or crack, should be tightened before new antifreeze is put in. This includes clamps on hoses to the heater—and the transmission-oil cooler if the car has one.

Some drivers say, "Glycol makes my heater work better." It does so indirectly, by enabling you to use a 180° thermostat in the cooling system. With methanol, you have to stick to a 150-160° thermostat.

Detroit now puts 180° thermostats and ethylene glycol into some new cars for several reasons. Some new owners prefer glycol, so providing it for them saves the trouble of switching coolant and thermostats. Engineering-wise, manufacturers favor 180° 'stats to minimize low-temperature operating problems. The higher operating temperature makes for more efficient engine operation, cuts down on sludge formation.

What are glycol's drawbacks? Like plain water, it can become acidic after long use and contamination with dirt, rust and combustion products. To retard this, all reputable makers add a chemical or petroleum-base inhibitor (some use both types). The first type neutralizes acid as fast as it forms. An inhibitor with a petroleum base coats internal metal surfaces with a corrosion-resistant film.

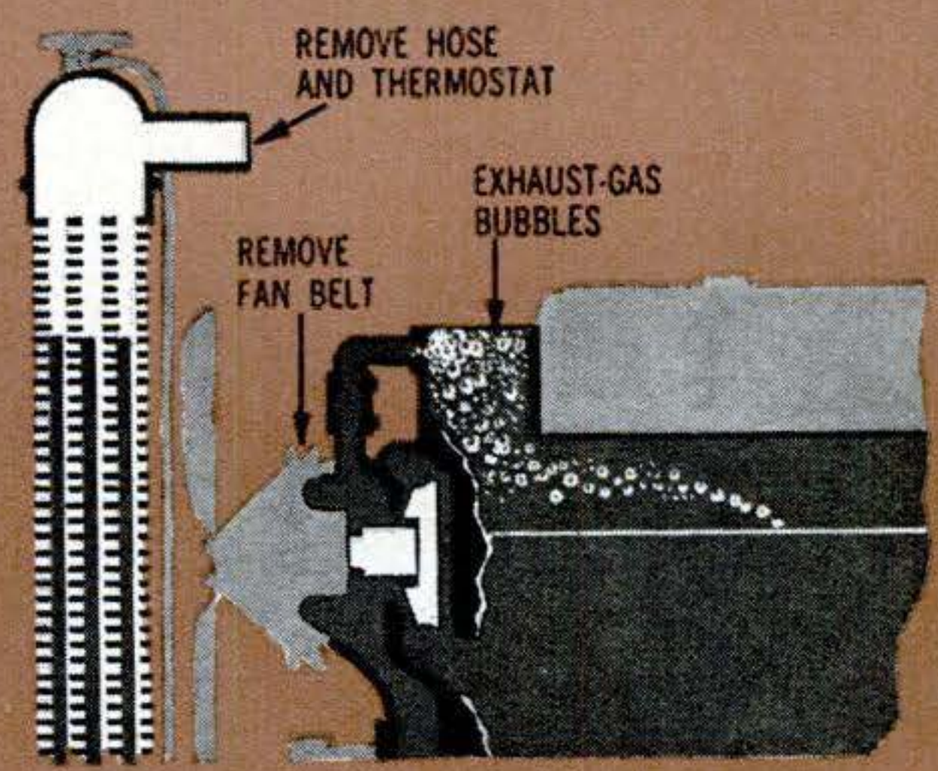
After some months, however, the inhibitors have been depleted and the status of the coolant begins to swing from alkaline to acidic. When the inhibitors are completely exhausted, acidity can increase fast, greatly accelerating if air or exhaust gas is leaking into the cooling system—as it does in many cars.

At worst, such contaminated coolant can corrode passages in the block, head and radiator, and chew out the water pump. But this could happen with plain water too—water is itself corrosive, as is any coolant with water in it unless inhibited.

Yet some owners do leave glycol in for years. How do they get by? The swing to acid formation depends on the kind of water used to begin with, the condition of the car (defective pump seals that admit air, and bad gaskets that leak exhaust into the coolant are adverse factors), and the kind of driving done.

If one does little driving, and that at moderate speeds, glycol may last two or three seasons, especially if it is stored

How to spot exhaust leaks



EXHAUST gas in the cooling system contaminates antifreeze. To check for it, let the engine cool, remove the fan belt and partly drain the system. Then remove the top radiator hose and the thermostat. Add water to the radiator to fill the block to the height of the hose neck.

Load the engine by jacking up the rear wheels, shifting into high, and feeding gas while braking gently. If the car has an automatic transmission, block the wheels, set the hand brake hard, hold the foot brake down, and shift to drive. Then repeatedly step on the gas.

Have a helper watch the water in the hose neck. Bubbles or a rapid upsurge in the water indicates exhaust leakage. The test must be made promptly to avoid heating the engine to a point where steam bubbles will mislead you.

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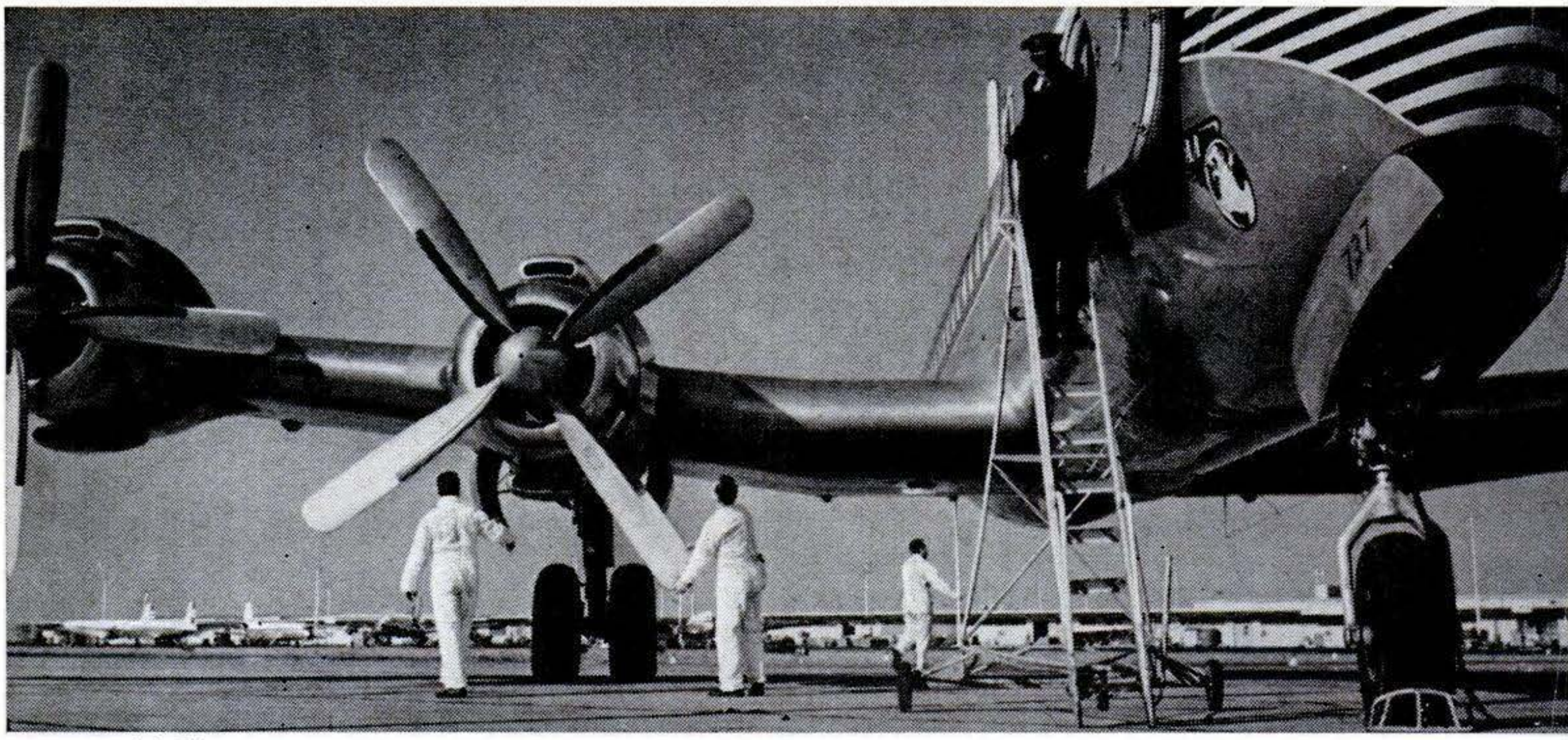
Car makers—over *twice* as many car makers (including Rolls-Royce) specify Champion spark plugs—thirty-six different makes in all!



Airlines—*all* of the world's major airlines use Champion spark plugs for the safe, dependable performance the airlines *must* have at any cost!

Q. Why is it that wherever performance is vital—on land, sea or in the air—the experts choose Champion spark plugs?

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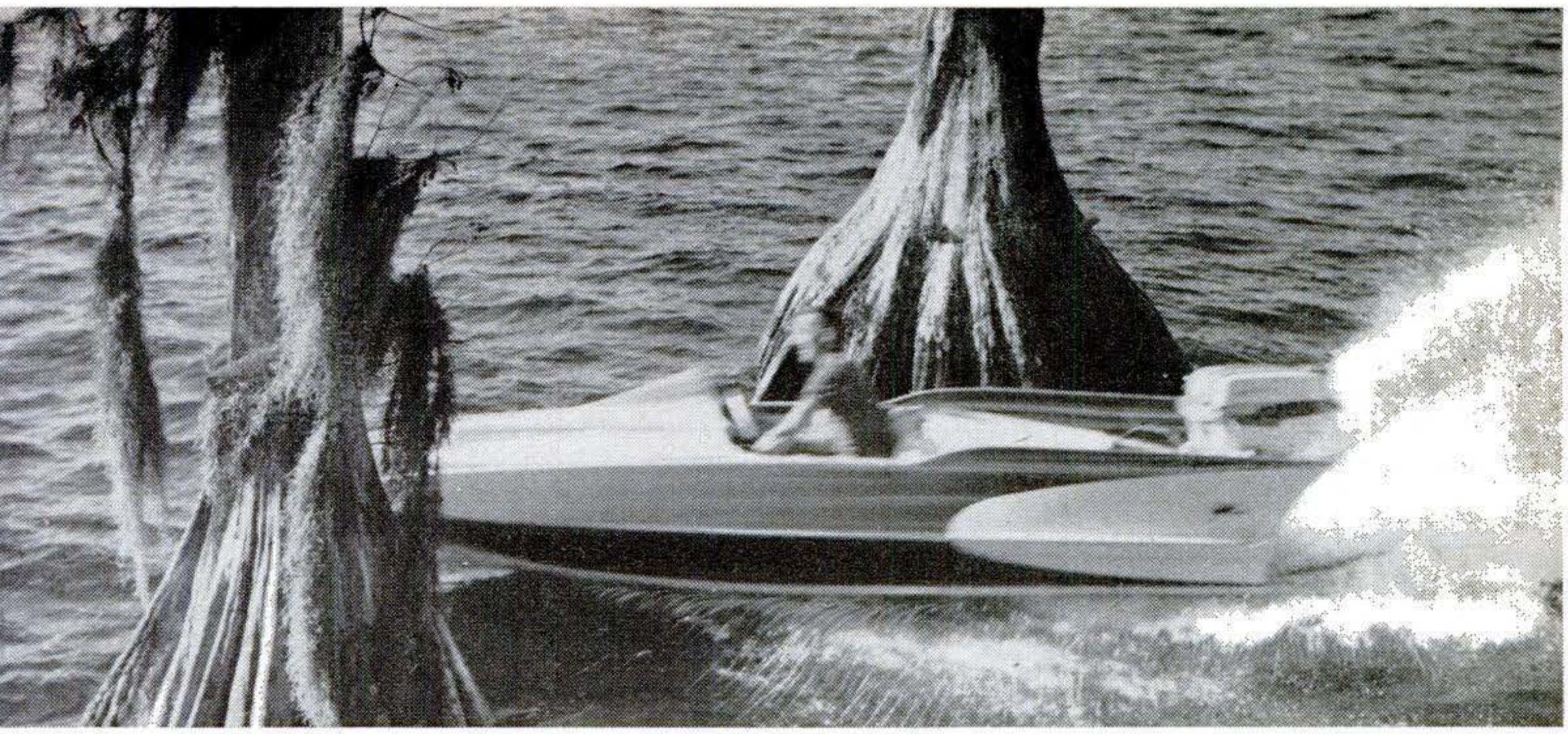

Outboard engines—*all* the major U. S. manufacturers of outboard engines use Champions for easier, dependable starts, smoother performance.

Racing cars—8 out of the last 9 Indianapolis winners used Champions. And 9 out of 10 *stock* car winners over the past 5 years used Champions!

A. The experts know from experience that you can always depend on Champions. To get the best performance from your car, put in a new set of Champions every 10,000 miles!

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over the summer in glass rather than metal containers. (Stored antifreeze should be labeled and kept out of reach, as it is highly poisonous.)

But you cannot be sure how long past a normal season's use any coolant will stay on the safe side of alkalinity. Even a costly lab check could not predict this exactly. It could gauge only the present condition of the solution, but not the mechanical and operating conditions that will control the deterioration of the antifreeze.

In a survey of cars with antifreeze more than a year old in their systems, one in five showed acidity and rust deposits. Of another group with two- and three-year-old antifreeze, 68 percent showed rust or deposits. The age of the antifreeze in these cars indicates that any inhibitors once present were probably exhausted—and without inhibitors any coolant could turn acidic or cause corrosion.

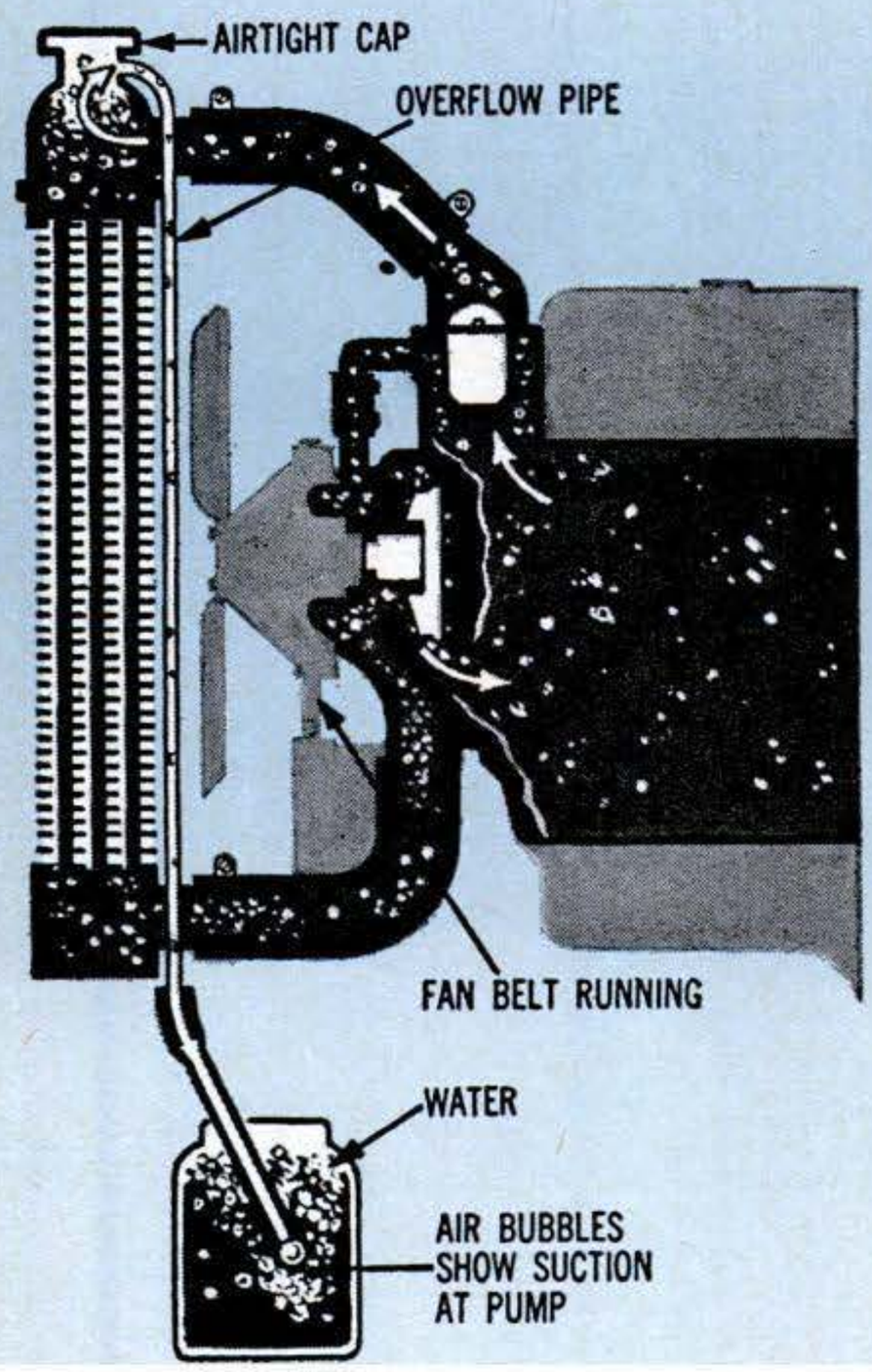
If you do want to gamble on another season's use from old ethylene glycol, better check cylinder-head joints for leakage, tighten all hose connections and check your pump for air leaks. And don't make a habit of hard driving. High engine heat helps break down antifreeze, so exhausting the inhibitors sooner, while high speed and heavy engine loading boost the risk of air or exhaust leakage, which also hasten oxidation and acidification.

Glycol can add its share of trouble if coolant gets into the crankcase through a bad head gasket or porous casting. But if any coolant that contains water gets into the crankcase, it can form sludge, cause corrosion and high wear. Water or alcohol will partly evaporate through the breather cap, but will cause trouble if enough gets in. Glycol—with its higher boiling point—will evaporate even less, and the emulsion it forms with oil, when cooked by high-speed engine temperature, forms a tough "varnish" on engine parts, making hydraulic valve lifters stick and in rare instances seizing the whole engine.

This doesn't happen often, won't happen if a car has a good head gasket and the bolts are torque-tightened as recommended by the engine manufacturer.

Makers of glycol antifreeze claim that it's in a small one-figure percentage of glycol leakage cases that seizure occurs. Since the varnish "takes hold" as the engine cools and not when it's running, metal damage is rare. The varnish can be removed without disassembling the engine by the use of a special solvent.

How to check for air suction



AIR drawn into the coolant hastens oxidation, depletes inhibitors and promotes corrosion. The modern water pump may allow air to enter at the cover gasket, thrust seal or shaft seal. To check, replace the pressure cap with a plain one, making sure it's an airtight fit. Slip a rubber tube on the lower end of the overflow pipe.

Fast-idle engine until it reaches operating temperature. Then, without changing engine speed, hold the end of the rubber tube in water. A steady flow of bubbles from the tube indicates that air is being sucked into the system.

The facts about methanol

THIS is wood alcohol, the antifreeze usually having inhibitor and identifying dye added. Pure methanol boils at

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149°. Mixed with water to protect down to zero, it boils at 178°. With a nine-pound pressure cap it boils at 183°. Since air pressure determines the boiling point, at high altitudes it boils even sooner; although it has been used successfully at mile-high elevations.

Never put in more methanol than you need. As you increase the methanol content to boost freeze protection, you also lower the boiling point. This limits methanol's use where very cold temperatures may alternate with mild ones.

Methanol may burn if a hose breaks, and its fumes can be poisonous in a closed garage. Removal of the pressure cap with a hot engine releases explosive vapors, so it should be avoided if possible and never done indoors.

Evaporation is less of a problem than you'd expect if the thermostat and operating temperature are in the right methanol range. Under normal driving with a 150-160° thermostat, methanol does not evaporate significantly. When it does, however, the antifreeze protection falls.

Methanol's chief problem is afterboil. When you shut off the engine, the coolant stands still. The still-hot block then heats it with no chance of relief through normal radiator circulation. Coolant temperature may rise 20 to 25°, which normally does no harm.

But after hard driving the rise may be as much as 40°. Later you may find a puddle under the car, a sign that some solution has boiled out of the overflow pipe. A weak or poorly sealing pressure cap will increase the loss.

After several such boil-offs, you'd better add antifreeze—not pure methanol, but the same mixture you put in the car in the first place, for on afterboil, water and methanol go out of the system together. (Since some alcohol may also be lost by evaporation, an occasional hydrometer check is necessary to keep tabs on your freeze protection.)

Alcohol won't form varnish if it gets into the crankcase, but since any coolant in the oil breaks down lubrication and forms sludge, such leaks must be corrected. And, as with glycol, the gradual breakdown of inhibitors is good reason to discard old methanol antifreeze after a season's use.

Choosing between the two

ETHYLENE glycol is your best bet if you want the added safety margin of a high boiling point, if you drive hard drive in high altitudes, do much stop-and-go driving or idling, or want top output from your heater.

Methanol may be your best buy if your cooling system is in such shape that some coolant leakage is inevitable, if you are not a hard driver, if you don't need way-down freeze protection and your heater delivers enough warmth on a 150-160° thermostat.

It's a comforting fact for nervous car owners that as little as five to 10 percent of either glycol or methanol in the system will prevent the water from freezing hard. No matter how cold it gets, it will form only slush ice, which rarely cracks engine blocks.

Such ice does, however, impede coolant circulation and so can cause overheating (which *may* crack engine parts). It can also damage gaskets and pump impellers.

One big mail-order house offers, in addition to ethylene glycol and methanol antifreeze, a methanol product with a small percentage of glycol as a buffer. The theory here: If the methanol boils off, you still have glycol. Technicians say this is chiefly to soothe nervous owners.

There is no point in mixing the two types yourself. It may make trouble, for different inhibitors could react chemically to form corrosive or clogging substances. Also, you would not be able to read your freeze protection accurately on a hydrometer with such a home-brewed mixture.

With a tight system, the correct thermostat and proper seasonal servicing, you'll escape both freeze-ups and hot-weather snafus. It's the best prescription yet to keep you rolling when others are boiling. END

Next Month: Do you know how to drive correctly with an automatic choke? An acquaintance with that little round box on the side of your carburetor will help you start your engine faster these cold mornings and improve your gas mileage. An authoritative article in December Popular Science gives you all the facts.

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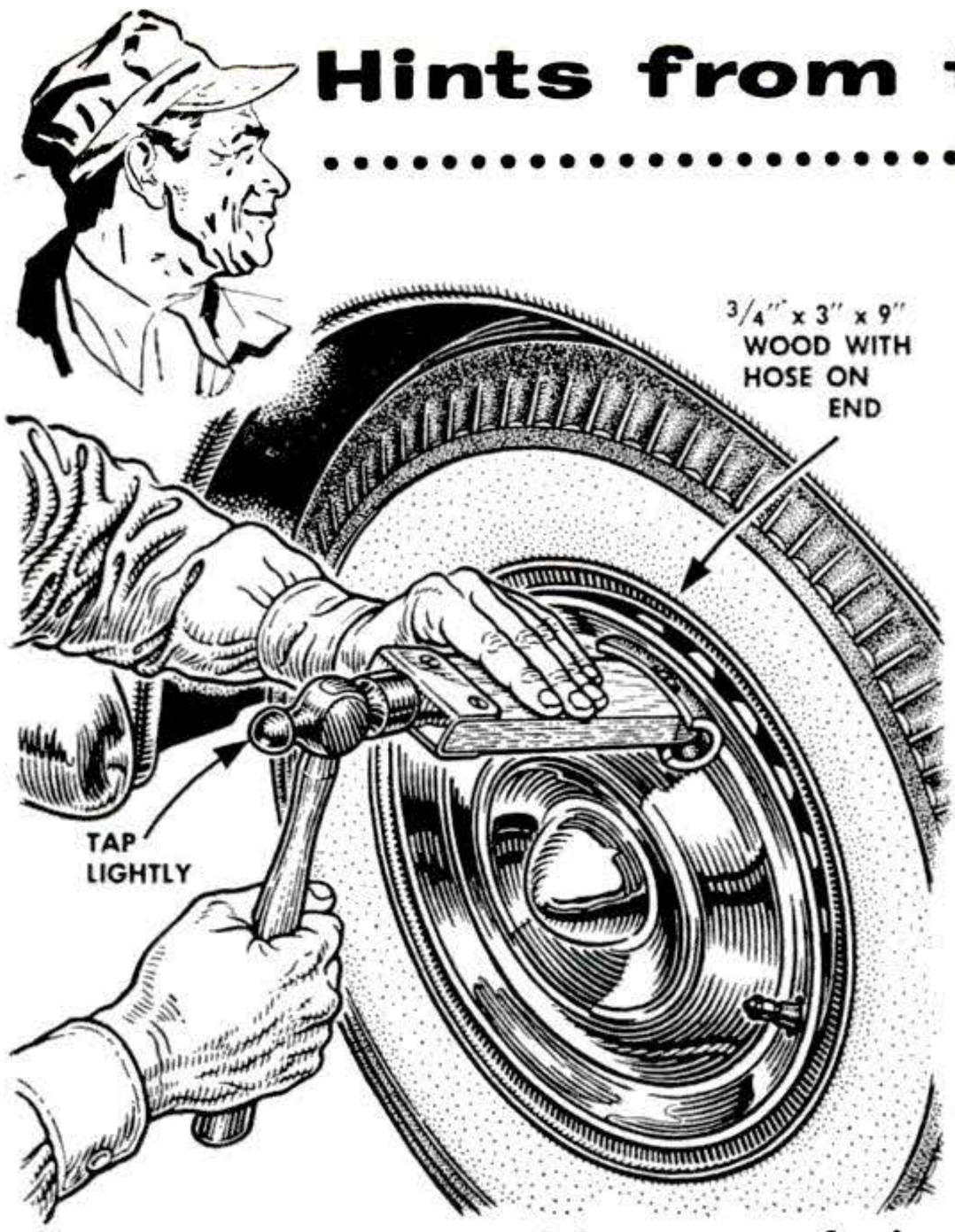
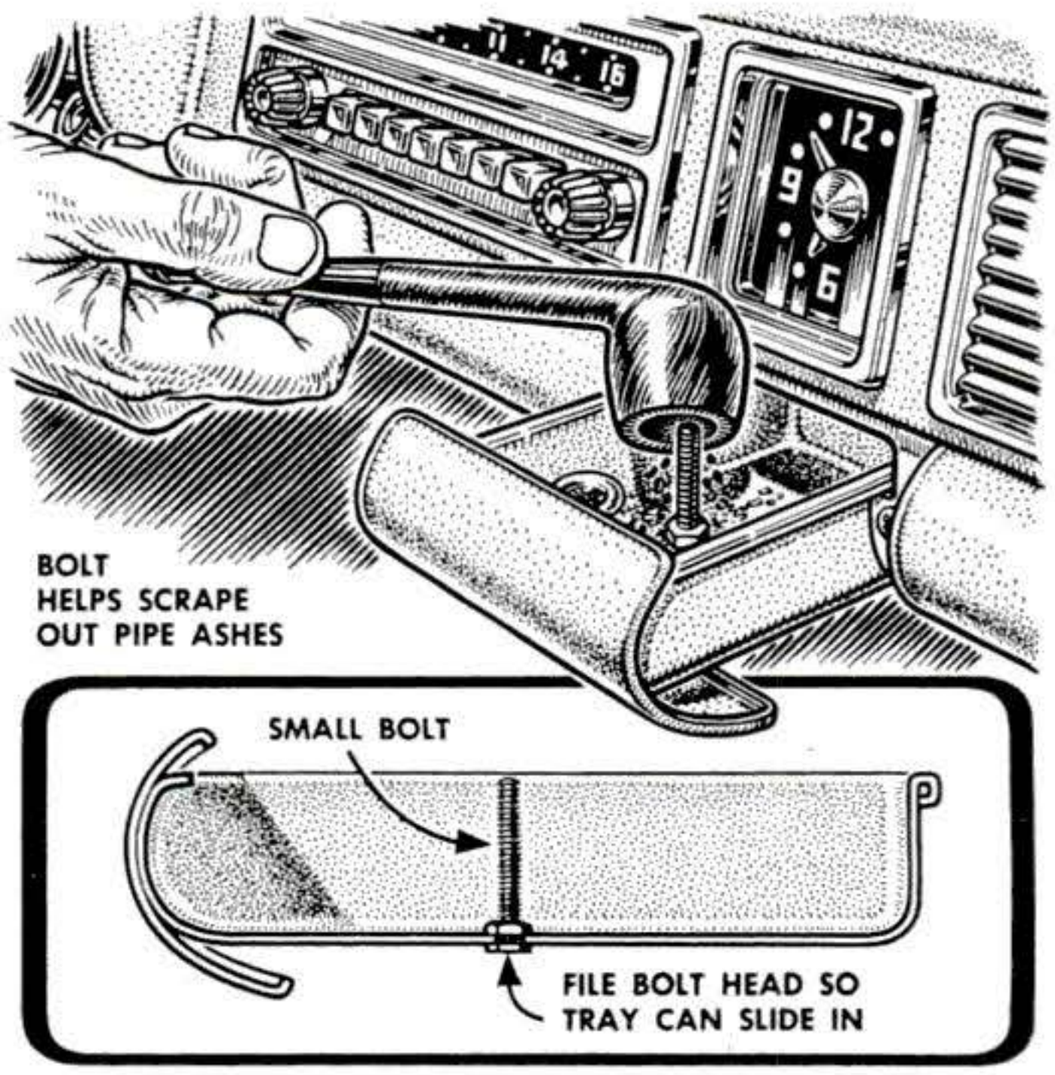
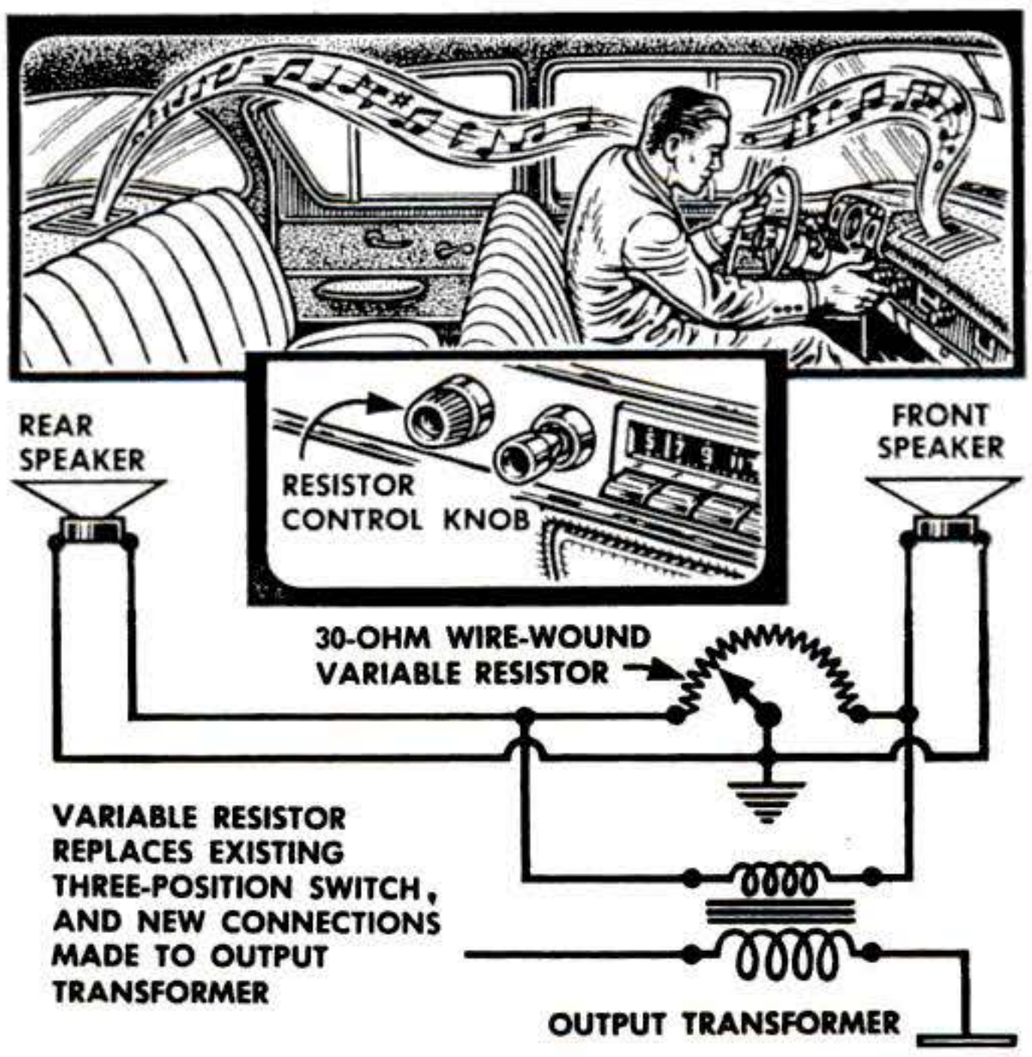
Hints from the Model Garage



Wheel covers can be driven securely in place without denting them with this quickly made tool. Round off one end of a piece of wood and cushion it with a short length of heater hose. Fasten a steel plate around the hammering end.



A pipe reamer, made by locking a 1" or 1½" machine screw in a hole drilled in the bottom of the ash receptacle, will clean out the bowl neatly. Countersink the screw head or file it nearly flush if it catches when the tray is pushed in.



Volume of front and rear speakers can be delicately adjusted with a variable resistor. Centered, the control puts both speakers at equal output. Turned to either side, it gradually reduces the volume of one and steps up the other.

A dash vanity like this will make a hit with lady passengers. Solder hinges to the metal back of a small mirror and mount it inside the glove-compartment door. The compartment light will illuminate the area for face fixes at night.

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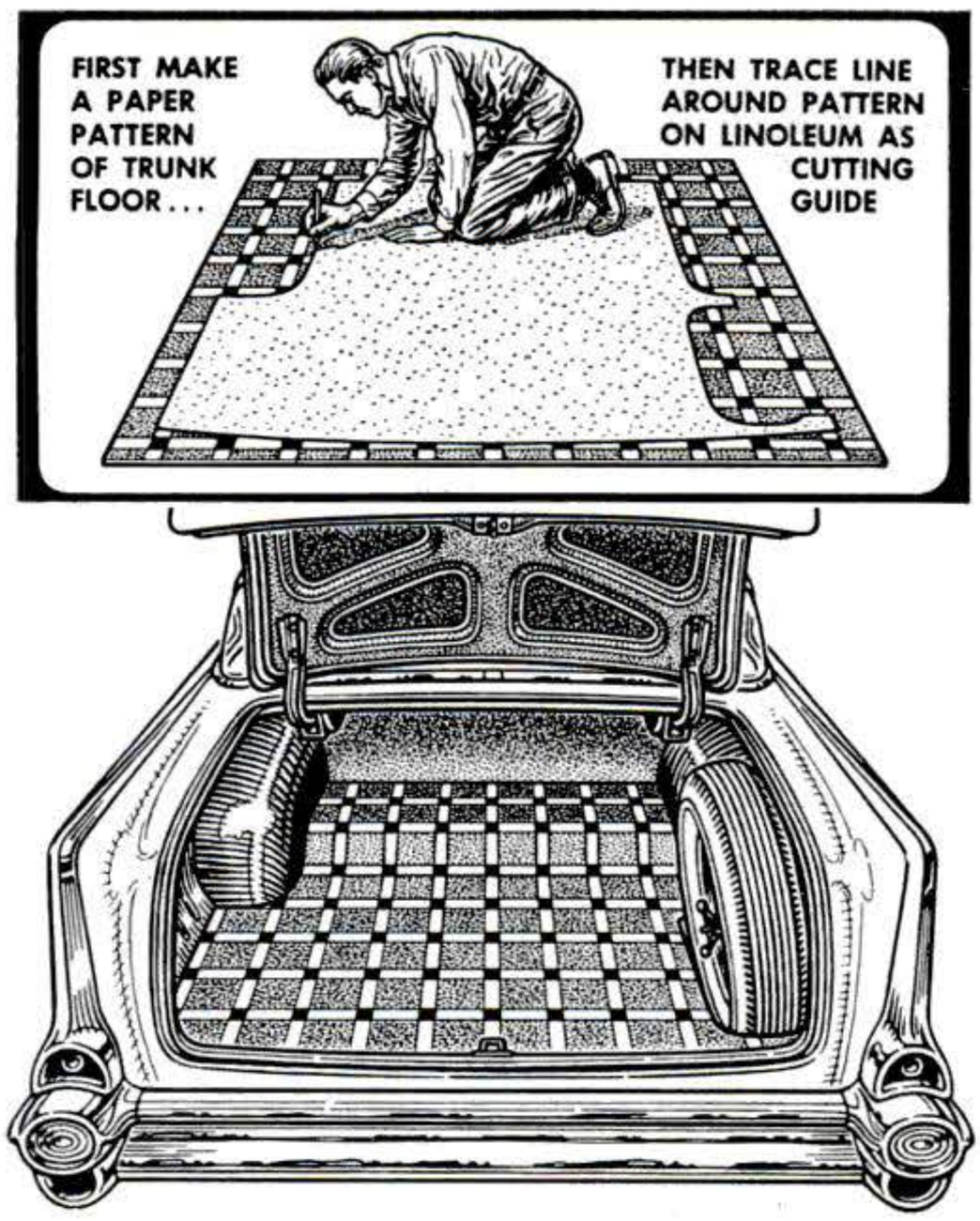
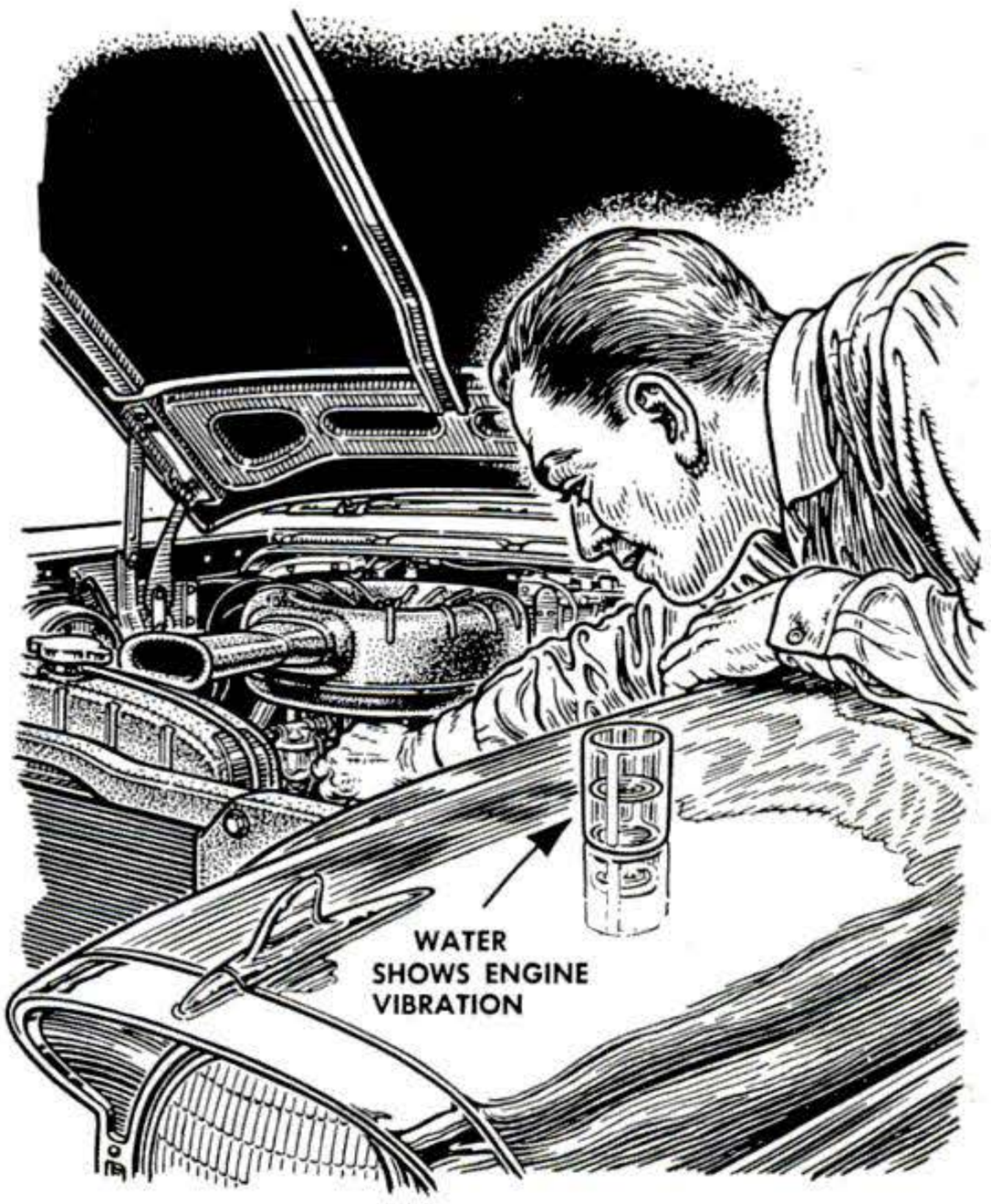
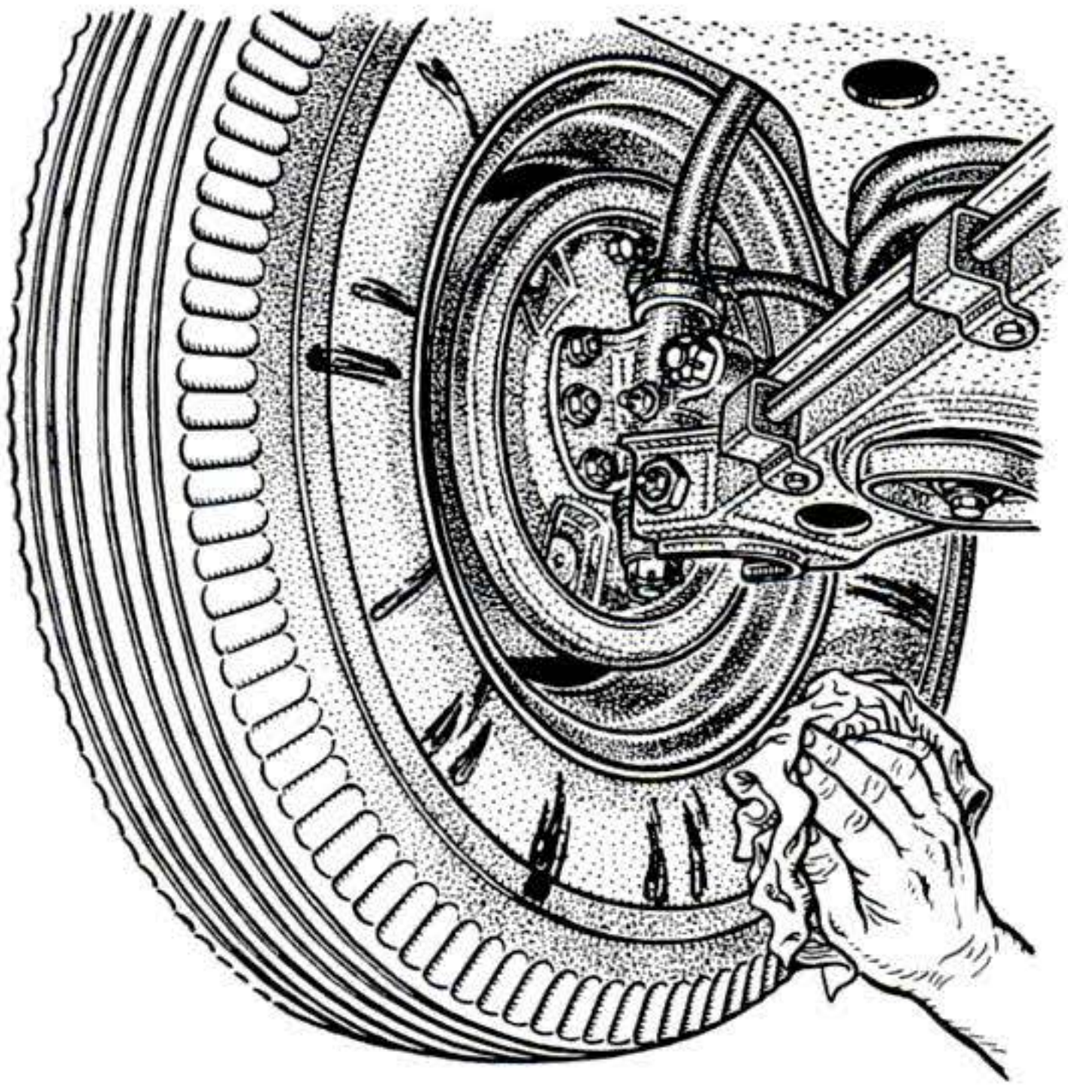


For a neat trunk that's easy to keep clean, cut a paper pattern to fit the trunk floor and trace its outline on a piece of linoleum. Installed in the trunk, the linoleum presents a smooth surface that won't scratch luggage.



A glass of water placed on the front fender will guide you when adjusting the carburetor. Turn the idling screws in or out until the water is least agitated. At this point, the jets will be set for the smoothest idle possible.



Wipe front tires clean after you have your car lubricated. Grease forced out of front-end fittings invariably falls on the inner wall of the tires and, if allowed to remain, it will soften the rubber and eventually weaken the tire.

Do You Have an Auto Hint? Send It in and Win a Prize

HAVE you discovered or developed a moneysaving short cut for making your own auto repairs? Have you found an easier way to do a difficult job? Got a tip that will make driving safer or easier? Or do you know someone who has an original tip, one not previously published?

POPULAR SCIENCE will pay a cash prize of $15 for every auto-repair hint accepted for publication each month in Hints from the Model Garage.

Describe your idea as completely as you can in words. Add a pencil drawing, or shoot a photo, if you feel that this will make it more easily understood. Address your entry to Model Garage Editor, POPULAR SCIENCE, 353 Fourth Ave., New York 10, N. Y.

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Gus Mends Some

The car was brand-new and ran like a dream—but Steve begged Gus to find something wrong with it

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Fences

"Guess I can fix this old clunker," Gus told McShane. "It's those fancy new cars that develop unpredictable troubles."

By Martin Bunn

STROLLING towards the Model Garage, his jacket flung over one arm, Gus Wilson looked up at the early-morning sky, cloudless but hazy—a promise of Indian summer after a premature cold snap.

"Hope it holds for the barn dance," he mused, catching sight of the pile of pumpkins Stan Hicks, his assistant, had arranged in front of the pumps. Stuck in the center was a sign, "Are You Squared Away for the Square Dance? Get Your Tickets Here." At the bottom sprawled a young man, his crew-cut head pillowed between two pumpkins.

"Hi," Stan greeted his boss. "Look what I found when I opened up this morning." He pointed to a big, new, shiny car parked off to one side, and then to the sleeping figure. Gus recognized Steve Jenkins.

"What's young Jenkins sleeping off?" he asked. "Thought he was off to college."

"Home for the holidays," Stan said, "and for the barn dance—I guess."

"You guess?" Gus draped his jacket over a pump standard. "What's the story?"

Stan shook his head. "He was here when I arrived. Said he'd been up all night trying to find something wrong with his father's new car. Then he asked for you and fell asleep, like you see him there."

The kid had busted something and was afraid to bring the car home, Gus figured. "Check the car?" he asked Stan.

"First thing," Stan answered. "Nothing wrong; it runs like a dream. I'll show you." He slipped behind the wheel, turned the ignition key and stepped on the starter. The engine purred.

"Mr. Wilson!" It was Steve, getting to his feet. "I'm in trouble, Mr. Wilson, real trouble."

"Not car trouble," Gus said. "If I remember, you were top man in auto mechanics back in high school, Steve. Listen to that engine."

"That's just it, Mr. Wilson. There must be something wrong." His young voice hit a falsetto. "There *has* to be."

"Your dad know you took his car?"

"Oh, sure. It's not *my* father that's after me—it's hers, Cathy's."

"Cathy McShane?"

Steve nodded. "He said he'd blast me

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with a shotgun if I ever came out to his farm again."

"If Bert McShane said that, he must have had a reason."

"Well, not really, Mr. Wilson. You see . . ."

THE story came tumbling out. He had taken Cathy to a movie and on the way back the car had stalled. Instead of walking the girl home, Steve had been eager to show off his mechanical skill. He had practically taken the engine apart without finding anything wrong. Then Cathy, who had been sitting behind the wheel, had stepped on the starter, and the engine caught. But by that time it was after midnight, and Bert McShane, who was waiting up for them, blew his top.

"And now," Steve finished, "when Mr. McShane learns from my dad—they got a business deal on—that there's nothing wrong with the car he'll really come after me with a shotgun."

"It's not that bad," Gus said.

"That's what you think, Mr. Wilson. But you see, Cathy let slip where the car conked out—Lookout Point."

Gus nodded sympathetically. Lookout Point was the local lovers' lane. That wouldn't sit well with the father of any pretty teen-age girl.

"The car did stop last night, honest, Mr. Wilson."

"I believe you, Steve," Gus said. "Wait till I get my toolbox and we'll take a spin. Maybe your gremlin will show up again."

They were barely out of town, with Gus at the wheel, when the car suddenly died.

"That's just what happened last night," Steve said. He watched as Gus ran the starter. Each time he returned the key from the START position to ON, the engine died.

"Get me a jumper wire out of my toolbox, Steve, and we'll get her started and back to the shop."

"Any ideas, Mr. Wilson?" Steve asked as he handed over the wire.

"I'm not sure," Gus said as he hooked the jumper wire between the battery and the ignition terminal of the coil. "But I suspect that you've got an intermittent open in the ignition circuit."

Steve looked puzzled. "Guess I better brush up on my auto mechanics."

"You see," Gus went on, "this car has a voltage-dropping resistor in the ignition circuit to drop the ignition low voltage from 12 volts to about 7.5 volts. The starter solenoid engages a separate circuit, direct from the battery to the coil, to feed a full 12 volts for starting. That's probably why the engine runs on the START position yet stops when I return the key to ON."

"Maybe a rough spot in the road shook something loose in the regular ignition circuit?"

"Could be," Gus said. "Might be a faulty ignition switch or maybe a broken resistor winding. Anyway, you probably jogged something back into contact while you worked on it out at Lookout Point last night."

Steve was silent on the trip back.

"Cheer up, Steve," Gus said as they pulled up in front of the Model Garage. "At least we'll find the trouble so that your father won't have a breakdown and blame you for mistreating his new car."

"It's not that, Mr. Wilson. Even if I can prove now that I wasn't lying to Cathy's dad, I'd never be able to get him to hear me out. Cathy is a swell girl, and we had a date to go to the barn dance Saturday night. That's off, I guess." He sighed and got out of the car.

GUS, knowing better than to offer sympathy, began checking the ignition circuit from battery to switch with a voltmeter. Then he checked voltage at both sides of the resistor. No amount of jiggling could make the meter hand waver.

Scratching his head, Gus looked at Steve and said, "It can't be open between the output side of the resistor and the coil. That wire is common to the starting circuit and the normal ignition."

Steve had noted each check. "Maybe this is pretty stupid, Mr. Wilson, but you checked *on* the wire end terminals at the resistor. Could there be a cold-solder joint or something, inside the double-wire plastic terminal at the output side of the resistor? I built a radio once that wouldn't work because of a cold-solder joint."

"You may just be right, Steve." Gus dug for his pocket knife.

He sliced the plastic coating from the terminal, exposing an unsoldered wire that missed connection by a few thousandths of an inch.

They looked at each other and grinned.

"This setup to provide 12 volts for

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ACon-O-Mizer

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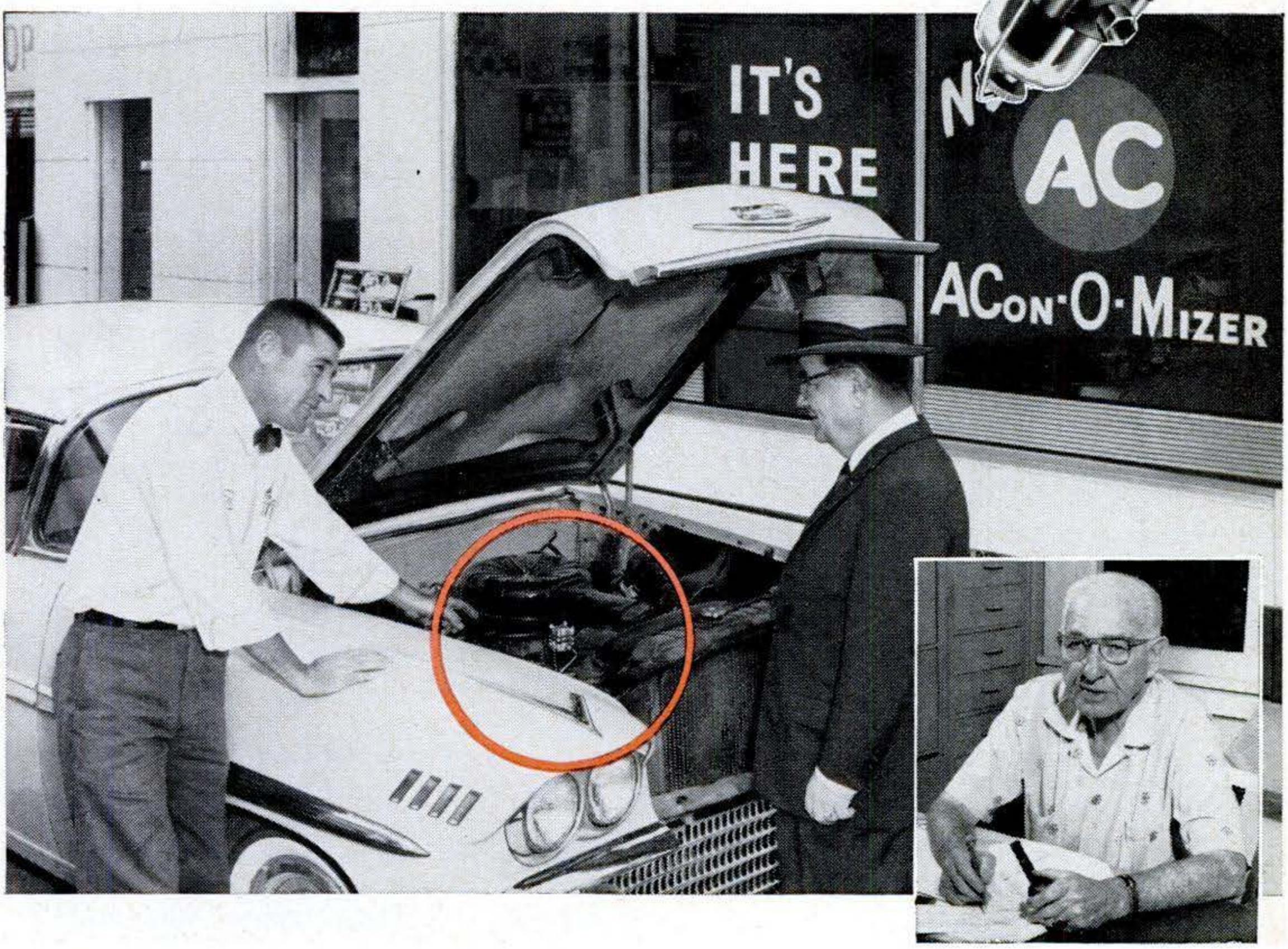

"I HAVE INSTALLED MORE THAN 50 UNITS," states Mr. William Chapman, Manager of Rouse Brothers Standard Service of Flint, "and my customers invariably report better performance and smoother idling, plus greater gas mileage. They're so satisfied that I couldn't buy back any of the ACon-O-Mizers I've sold!"

"I WOULDN'T TAKE 50 DOLLARS FOR MY ACON-O-MIZER," enthuses Mr. Pat Travers, Michigan Monument Sales Executive. "I frequently take a 300-mile business trip and I've upped my gas mileage, thanks to the ACon-O-Mizer. My car never ran better or smoother!"

"I've tried all types of gas savers but the ACon-O-Mizer is the only one that really paid off," says Pat Travers.

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starting is pretty keen," Steve remarked as Gus repaired the unsoldered wire end.

"Particularly for cold-weather starts," Gus agreed. "But it can be dangerous. With what amounts to two ignition circuits, one for starting, and one for running, the engine can run even with the switch off. Be sure the car is out of gear when you're working on it."

"Oh, I see—we thought this was the rumble seat."

"Thanks, Mr. Wilson—and thanks for the safety tip." Looking at his watch, he added, "Gee whiz, I have to run. Dad will be needing the car."

"Wait a minute, Steve. I'll put this on your father's account, but let me give you a receipted repair bill. Maybe it will help you get back into the good graces of Cathy's dad."

"It will take a miracle if I'm ever to see her again," the boy replied glumly.

Gus watched him drive off, lit a pipe and puffed away thoughtfully. "A miracle. I wonder if maybe I can perform Steve's 'miracle' by driving out to Bert McShane's farm?"

AS GUS drove down the road that passed the neat McShane farm, he spotted Bert mending a fence. Pulling the choke on his service car full out, Gus waited for the engine to cough, sputter and die. Then he got out, opened the hood and looked under.

"Hey, Gus," McShane called. "Want me to call a wrecker?"

"No, thanks, Bert. Guess I can fix the old clunker. Sure have had it long enough to be on to her quirks. It's those fancy new cars that develop unpredictable troubles."

"Yeah?" McShane bit.

"Yep." Gus closed the hood and wiped his brow. "Why just today some kid brought his dad's spanking new '58 model into the shop. The boy was out on a date last night when it stopped on him for no reason. After he monkeyed with it for quite a while it ran fine. We took it out on a rough road and didn't get a mile before it stopped the same way. Real tricky. Turned out to be a bad connection someone had made at the factory."

"Is that a fact?" McShane commented.

"Well, I'd better go now and let you get on with your job. Mighty important job that, Bert—mending fences."

"Yeah, Gus."

THE sound of music and laughter came from the big red barn as Gus drove up that Saturday night. He parked and handed a ticket to Stan Hicks at the door. A couple danced by, waving to him. It was Steve Jenkins and Cathy McShane, decked out in blue jeans and gingham.

Gus waved back as he walked over to a refreshment table where Mrs. McShane was chatting with Steve Jenkins' parents. "Where's Bert?" he asked.

"Right here, Gus," came McShane's voice from behind. "Drop in to remind me again how important it is to mend fences?"

"No, Bert. Just happened to hear the music and couldn't resist it."

"Sure—'just happened.'" McShane winked. "Like your service car 'just happened' to quit as you passed my farm?"

Gus grinned sheepishly. END

Next month: Gus clears the way for Christmas.

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The Wonderful New One-Arm Faucets

for kitchen sinks and bathrooms

By David X. Manners

ONE of the slickest home improvements since plumbing came indoors is making a glamorous appearance in hardware stores and homes all over the country. It's the one-arm faucet—a gleaming, gadgety device that gives you tap water at any temperature and in any amount at the touch of a single handle.

You push the handle forward—it works like an airplane control stick—and you vary the water flow from off to full on. Turn it sideways and you get any mixture from hot to cold.

Under test for several years, the new one-arms are already being made by more than a dozen manufacturers. Most makers of household fixtures expect that the new design will eventually replace the present two-handle, screw-type faucets completely. The reasons are more than glamour alone:

- If your hands are full or greasy, you can flick the control handle with your wrist or elbow.
- You won't scald yourself, because you preset the temperature you want *before* you turn the water on.
- You'll probably never have to stop a drip; a special two-stage valve prevents dripping.
- You'll never have to put in a washer because the new faucets have none.

Who can have one? Anybody can install a one-arm faucet in either a new or present home. They're designed to fit the standard openings provided on all types of fixtures. There are models for kitchen sinks, bathroom sinks, bathtubs, even showers.

They'll also fit old fixtures, with an extra benefit here. If your wife has been wanting a rinsing spray for the kitchen sink, you can substitute a new single-lever faucet that will leave one of the existing openings free to take the spray

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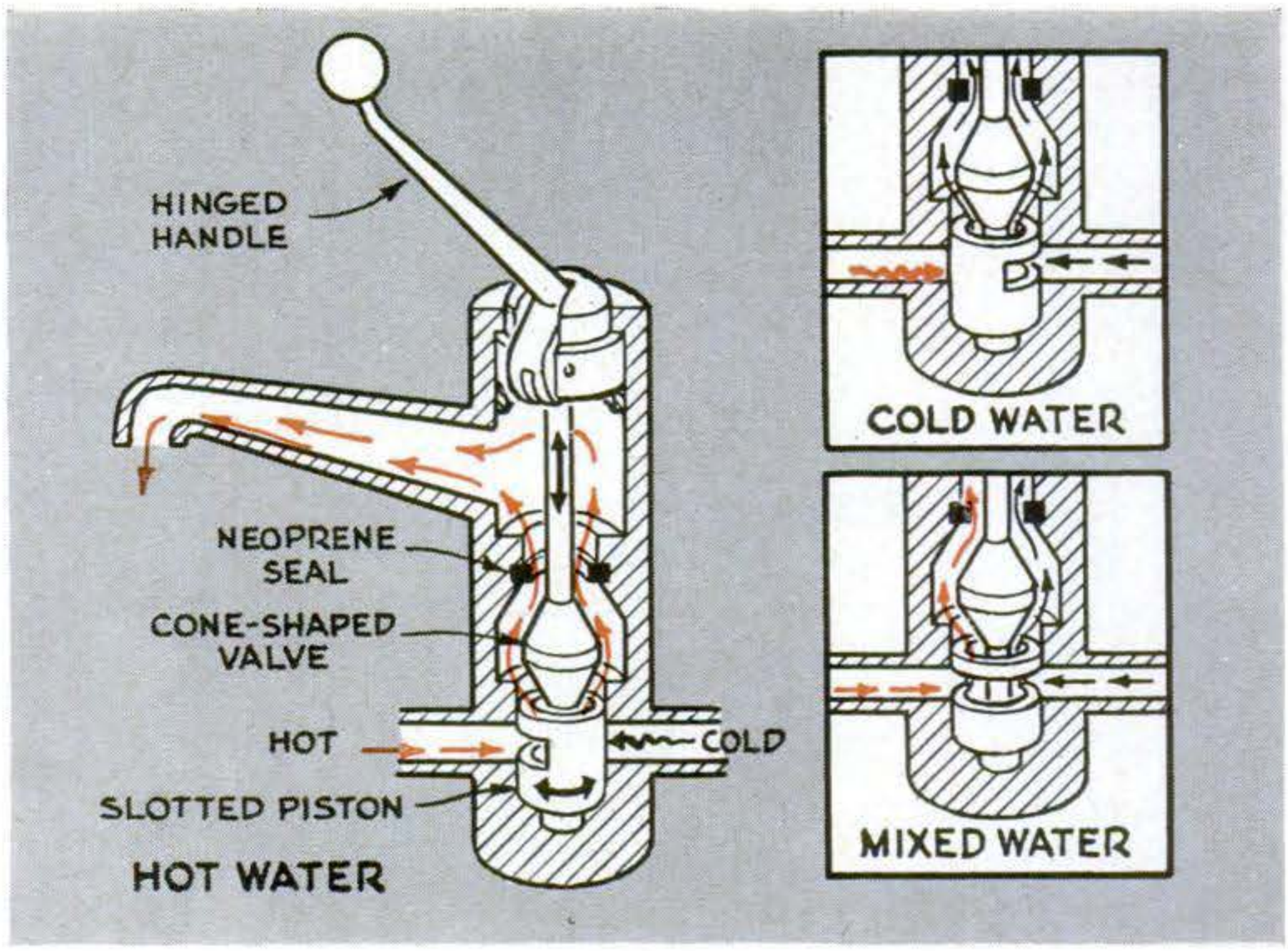
HOW ONE-ARMS WORK: To turn water on, ingenious sliding piston is pushed down, exposing hot and cold inlet ports at sides. Cross slot in piston then channels hot water (colored arrows) to spigot when turned to left, cold water when turned to right, or any mixture in between. Second, cone-shaped valve backstops water that gets past piston, preventing drip.

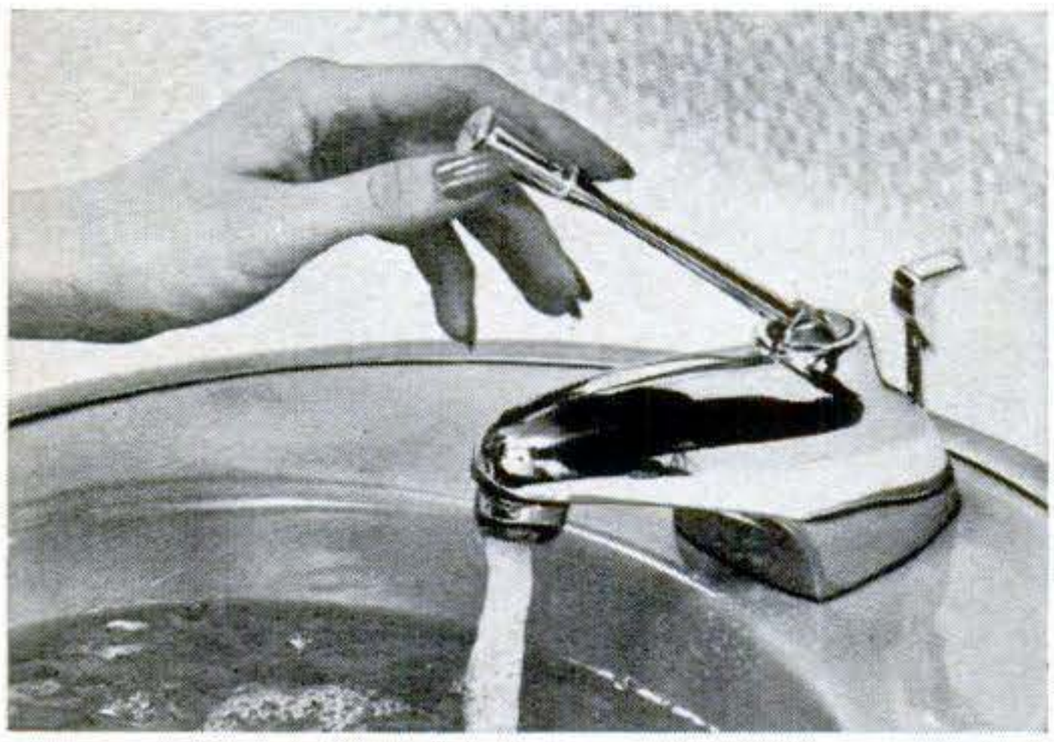


hose. Or if you have unused openings, you can fill them with such wife-pleasing conveniences as soap and hand-lotion dispensers.

How much do they cost? Right now, you pay extra for single-lever luxury. Most top-quality one-arms sell for $20 to $35—a good $5 to $8 more than you pay for a regular faucet.

But you can look for prices to come down soon. Already Sears, Roebuck is selling a one-arm model for only $16. Another major maker is rumored to have one ready for next year that will actually cost less than a conventional faucet.

Even at premium prices, one-arms are a good buy because of savings in maintenance. You aren't likely ever to have to call a plumber to fix one. You also save water—and the fuel to heat it—because you don't run it down the drain while you fiddle to adjust the temperature.



FOR YOUR BATHROOM, there are compact one-arms with built-in drain control at back. You can buy faucets separately or in combination with a basin, such as the modern Crane unit above.

How they work. Not all one-arms are alike, but the principle is generally the same. The Moen company, which pioneered the first type more than a decade ago, uses a stainless-steel piston that's moved up and down and rotated sideways by a hinged handle on top.

As the piston is moved up and down, it opens and closes ports in the side of the faucet that let in hot and cold water. A slotted valve across the center of the piston determines how much hot water is mixed with how much cold water, depending on how far the piston is turned to the right or left. Each action is independent of the other, so that you can change the temperature without varying the volume, or change the volume without varying the temperature—or do both at the same time.

A few types, mainly for showers, regulate only temperature, not volume. The amount of water must be adjusted separately at the spray head.

Why there's no drip. In conventional screw-type faucets, you *twist* the washer against its seat to stop the water flow. This grinds down the washer, causing leaks. Conventional faucets are also subject to "wire draw"—tiny scars on both the washer and its metal seat made by pinpoint jets of water. These tiny scars lead to leaks, too—and the cost of putting in a new valve.

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The one-arm faucet, however, is simply *pushed* closed, not twisted, so there's no grinding or scarring of a washer. In fact, there's no washer.

Most new single-lever faucets have a two-stage shut-off instead. The piston stops the main shock of the water flow as it slides past the inlet ports. Then a cone-shaped valve seats itself against a neoprene seal, stopping any small amount of water that gets past the piston.

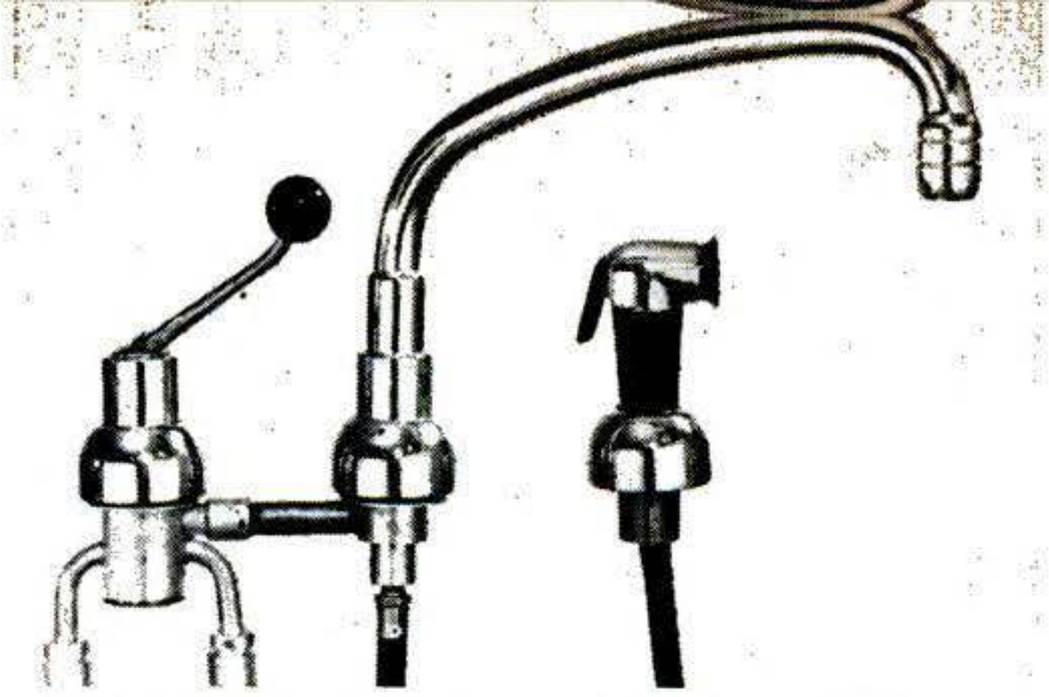
The result is no drip because there is no appreciable pressure against the second, neoprene seal. In recent tests, a one-handle faucet was turned on and off 3,000,000 times—and was actually working *better* at the end because the neoprene seal fitted more tightly after use than it did at the start. The testing machine broke down before the faucet did. The piston valve is also self-cleaning because water deposits can't cling to its glass-slick, stainless-steel surface.

The switch-over is simple. Installing most one-arms requires only that you disconnect the old faucet and attach the new one to your present pipes. The trick in doing this yourself lies mainly in the purchase of a "basin" wrench. This $2 tool enables you to reach otherwise inaccessible nuts up under the basin.

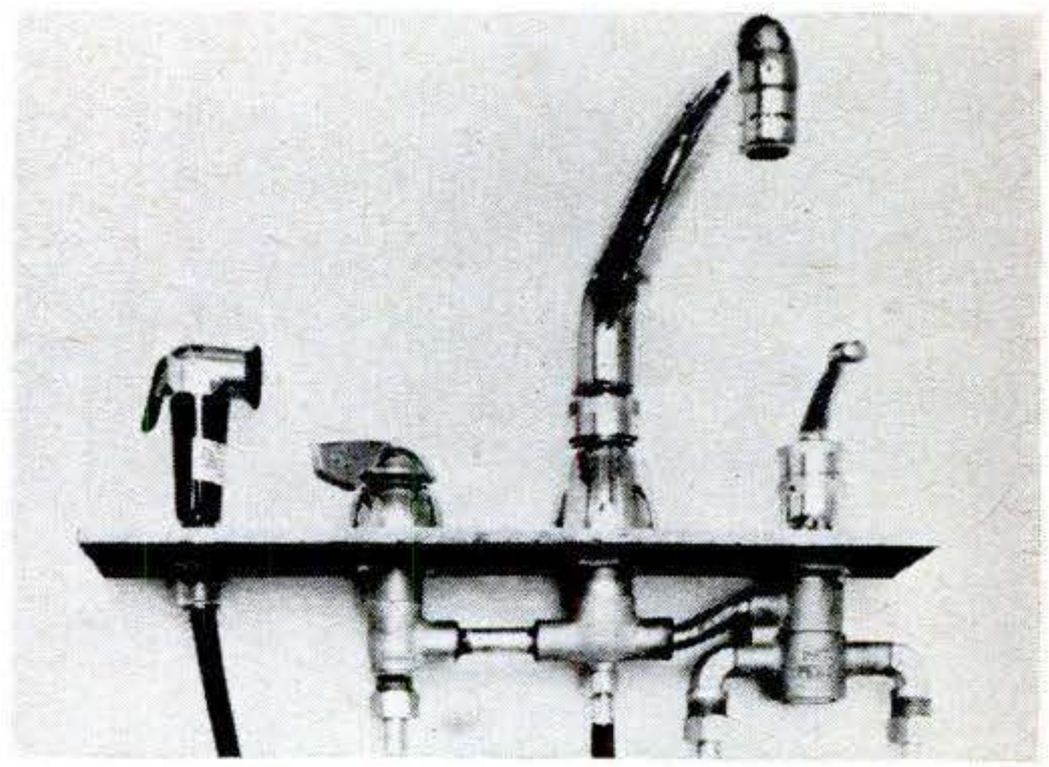
Manufacturers also advise that you break in a new faucet at full throttle for several minutes with the aerator removed. This flushes out any particles that might damage the seal.

Foot pedals next? One-hand faucets may soon find competition from no-hands faucets operated by your foot. Already, one foot-pedal control, similar to those long used in hospitals, is being sold for home installation. Made by the T & S Brass & Bronze Works, Westbury, N.Y., it regulates temperature but not flow.

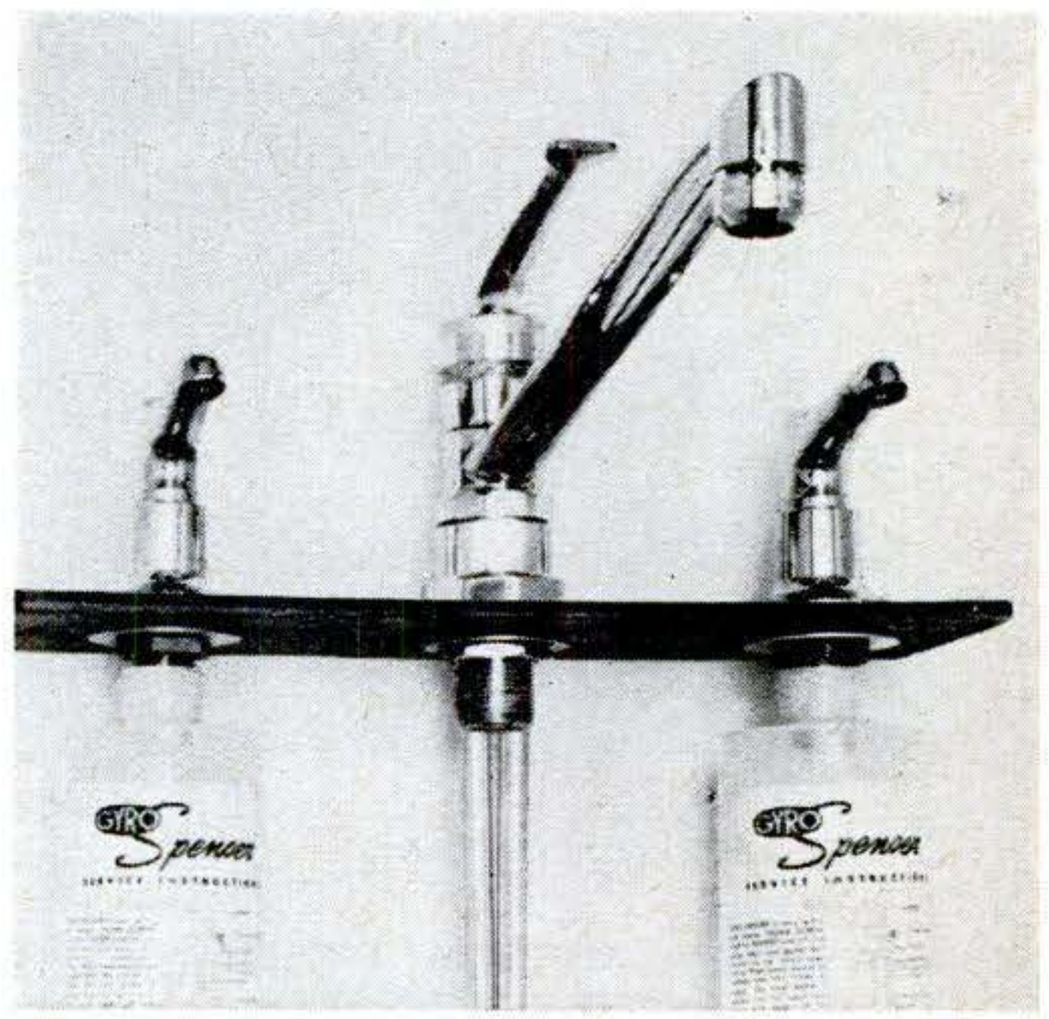
Also coming soon is a rotating spigot that can be turned upward for use as a drinking fountain. In any case, the big news in faucets is more fun and less fuss.



NEW FAUCETS ADAPT TO ANY SINK. This two-hole model frees third hole for a spray hose.



SETUP FOR A FOUR-HOLE SINK permits extra faucet (beside spray) for ice-water dispenser.



SINGLE-UNIT TYPE needs only one hole, leaves others for soap dispensers or a spray hose.

Who makes the faucets

Alamark Co., 11460 Reading Rd., Cincinnati.
American-Standard, 40 W 40th St., NYC 18.
A. Y. McDonald Mfg. Co., 1200 Pine St., Dubuque, Iowa.
Barnes Mfg. Co., Mansfield, Ohio.
Crane Co., 836 S. Michigan, Chicago.
Delta Faucets (Masco Screw Product Co.), 12825 Ford Rd., Dearborn, Mich.
Gyro Brass Mfg. Corp., Westbury, N. Y.
Moen Faucets, 377 Woodland Ave., Elyria, Ohio.
Sears, Roebuck, 925 S. Homan, Chicago.
Speakman Co., 3000 Sentinel Dr., Wilmington, Del.
Sterling Faucet Co., Morgantown, W. Va.
Universal-Rundle Corp., New Castle, Pa.

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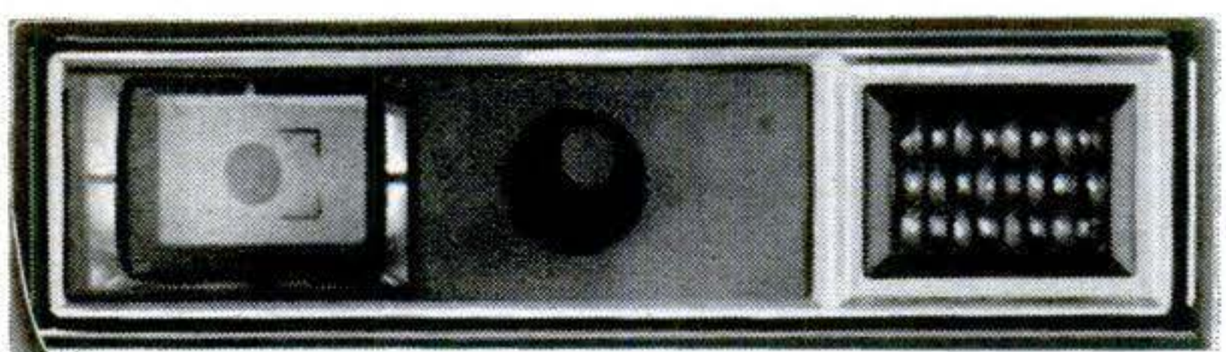
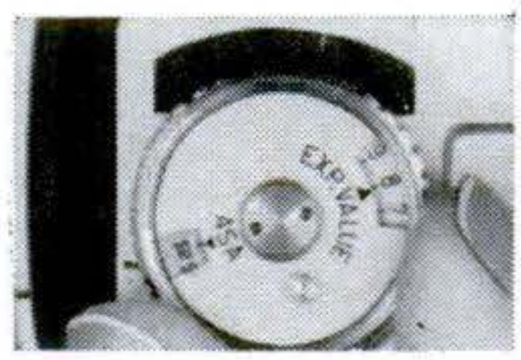
Wide range of photo aids includes wide-angle lens 35mm *f*/3.5, $57.50; telephoto lens 90mm *f*/4, $69.50; Multiframe Finder, $17.50. Many other specialized aids.



Smartly housed in camera control tower are the expert's devices for superior pictures—big-as-life viewfinder, precision rangefinder, sensitive photoelectric exposure meter.

Kodak
TRADEMARK



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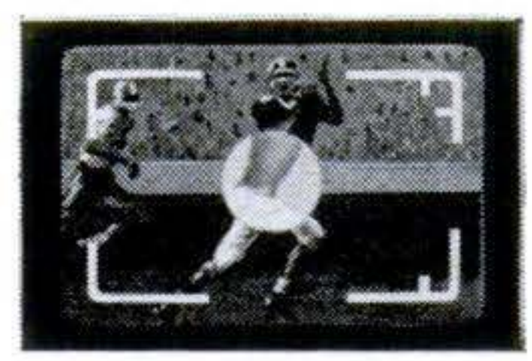

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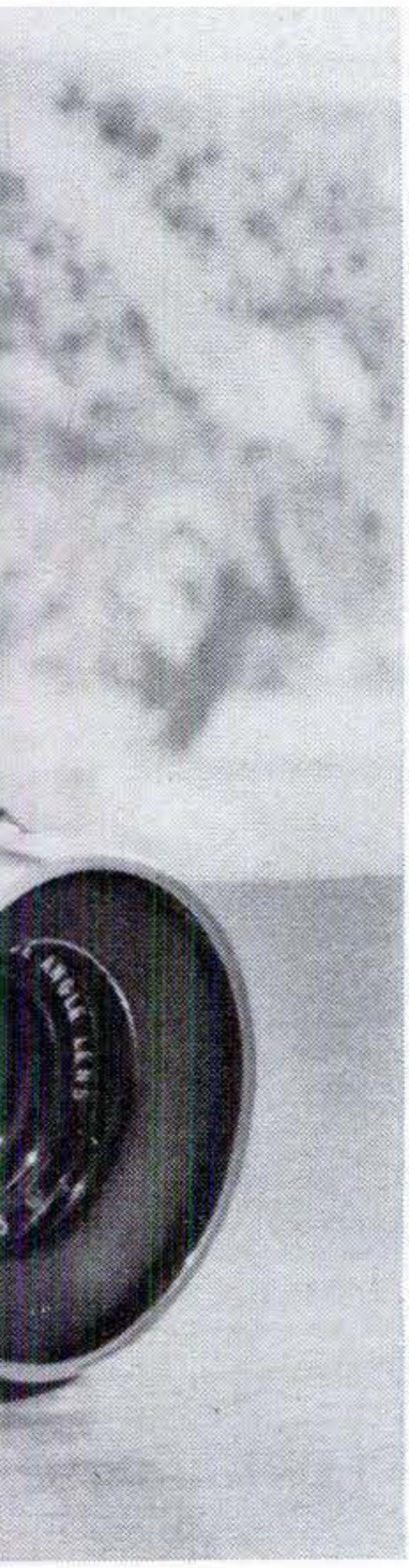

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(Prices are list, include any Federal Tax, are subject to change without notice.)

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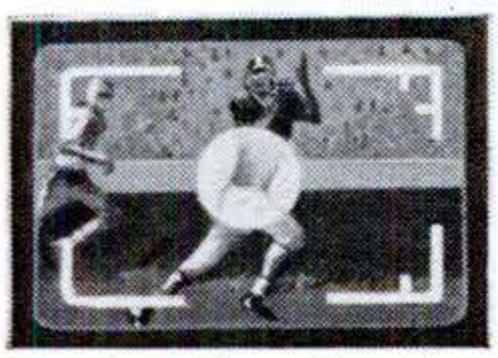

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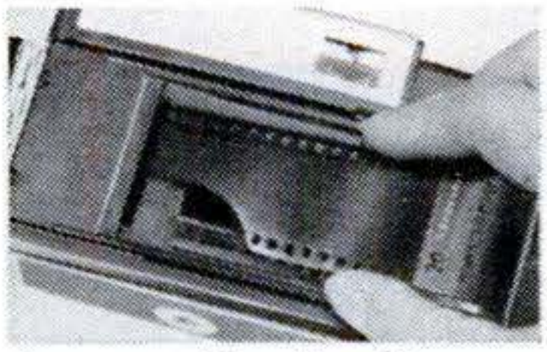
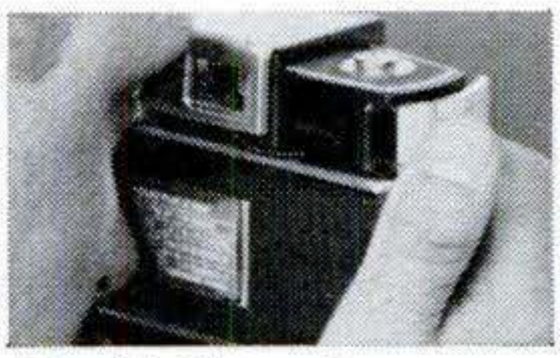
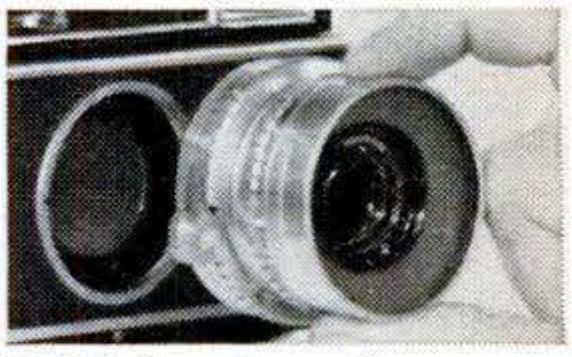


Instant film loading—you drop the film in—no threading. It's the quickest, simplest 35mm loading ever devised.



Rapid film advance—you can get shots in rapid sequence. Advance film with couple of quick thumb-flicks.



Quick lens interchange—you lift out normal lens instantly—drop in supplementary lens. No tricky mechanical match-up.

EASTMAN KODAK COMPANY, Rochester 4, N.Y.

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Recent improvements in valves and contents now make those fist-size pressure spray cans

The Easiest Way to Paint

By George Daniels

PUSHBUTTON paints have become big business. Last year, more than 30 million cans of the aerosols were bought and used for paint jobs ranging all the way from enameling a kitchen chair to touching up the family car. By 1967, manufacturers estimate, 100 million cans a year will move over counters, ringing up a $190,000,000 tune on cash registers.

Why the big boom? The biggest single reason is convenience—no brushes, guns or rollers to clean, no tedious mixing or stirring, no extras to buy. Just shake the can like a cocktail and press the button to start spraying. When you're through, turn the can upside down, blow out paint for a second or two until the spray turns clear, and your sprayer is cleaned. Then you can put it back on the shelf.

The paint can't harden in the can or form a skin. Even if you forget to clear the nozzle there's an easy answer. Just pull the spray head out like a cork (no paint will escape because the valve stays in the can) and clean the jet with a pin or fine wire. If the paint has hardened, soak the spray head in lacquer thinner a few minutes to soften the paint.

It wasn't always so easy. If you've

Convenience: You get steady pressure to the last drop

GAS MIXED WITH PAINT stays liquid until paint is used and pressure decreases. Then gas vaporizes, filling empty space in can and keeping steady pressure on paint to push it out nozzle. Gas is also blown out with paint, expanding and breaking paint into fine spray.

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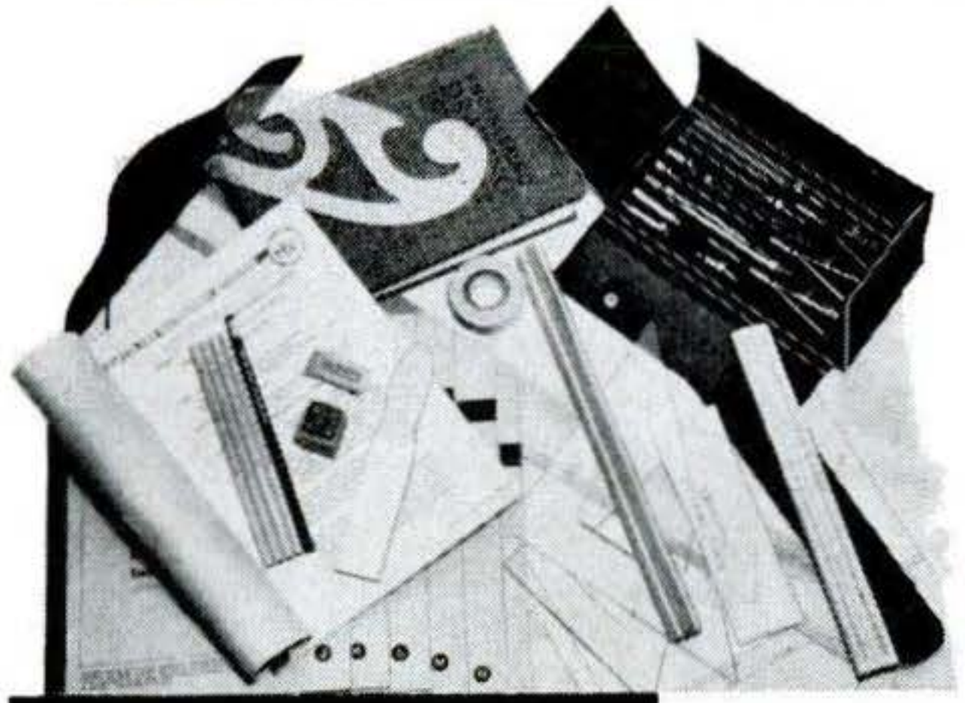

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heard some sad tales about early aerosol paint, they may have been true. Many of the first units were made by simply putting thick paint into sprayers used for thin insecticide. Often the paint spat or squirted instead of spraying, and when the nozzle clogged the show was over.

Today's smooth-spraying, non-clogging paints are a totally different breed. They're so recent that you may still find some old-type spray cans on store shelves. The quick test is to pull off the spray head to be sure you're getting the new, removable-nozzle type.

They're not for big jobs. With a 12-ounce can selling for about $1.50, you won't be using one to repaint the house. Yet, surprisingly, aerosol paint is your best bargain for many small jobs.

A fender scrape, for example, may cost you $3 to $5 or more for a professional touch-up job. For half this price, you can buy a matching aerosol can and do the job in a minute or two.

You'll find aerosol finishes to match not only your car, but even your outboard motor, as well as all household colors. There are decorative finishes in gold and silver, multicolors, and special materials that look like hammered bronze.

How much will a can cover? You can usually figure that a 12-ounce aerosol will cover about 12 square feet with one coat —more than enough for two coats on a typical car door. As a rough guide, figure about an ounce to a square foot.

If the paint is going over the same color, it will go farther, of course. The reason for the relatively small coverage is that the can's contents are only about half paint; the rest is a liquid-gas propellant, commonly Freon.

Pressure is steady. At normal 70-degree room temperature, a typical aerosol paint can has about 35 to 38 pounds-per-square-inch pressure when full, and, surprising as it seems, almost the same pressure when nearly empty. This means the spray doesn't slack off toward the end as it would with compressed air.

The reason for this strange behavior is that only a portion of the gas propellant is in the form of vapor to push out the paint; most of it remains a liquid, mixed with the paint. As the paint is used, more and more of the gas vaporizes, filling the empty space in the can and keeping a constant pressure on the paint.

Temperature and performance. Spray cans are designed to operate best at about 70°. As the thermometer falls, the spraying pressure falls. At about 22° below zero (not uncommon in some areas) the gas becomes a liquid entirely and your aerosol has no pressure at all. This is the basis of the "cold filling" process by which aerosol cans are loaded. The gas is cooled to around 40° below zero and poured in, then the cans are sealed.

At around 130°, the pressure in the can may be tripled or quadrupled, so you'll find warnings against storing the cans at temperatures above 120°. Is a can likely to explode? Not if you follow directions. By government regulation every can is heated to 130° to prove it safe.

How to get the most from a spray can. Be sure to read the instructions on each can before you use it. Cans vary—there are many types of valves and nozzles, and there may be important differences in the way they should be cleaned. Different paints, even from the same manufacturer, may also require different methods of application, especially as to the proper distance from nozzle to painting surface.

How to use aerosol paint. Handle your spray can just like a spray gun. Keep it moving parallel to the surface, and trigger it on as it approaches the near edge of the work, off as it passes beyond the far edge. Overlap each successive stroke about a third of its width.

A little slower to use than the average workshop spray gun, a typical 16-ounce spray can forms a 5″ to 6″ round spray pattern when held the usual 12″ to 18″ from the work. It puts a full coat on a square foot of surface in five to eight seconds. Smaller cans usually produce smaller spray patterns and call for less distance from the work.

If you accidentally get a run or sag, it's often possible to smooth it out this way: Turn the can upside down quickly, blow out the paint for a second or two, then use the clear gas stream to spread out the paint evenly.

To assure even color and a smooth spray, always give the can the full shake-up time recommended by the maker—usually a minute. Settled pigment in a long-standing can muffles the sound of the mixing balls at first, but the sound changes to a metallic rattle as the contents blend. A good final check: Give the

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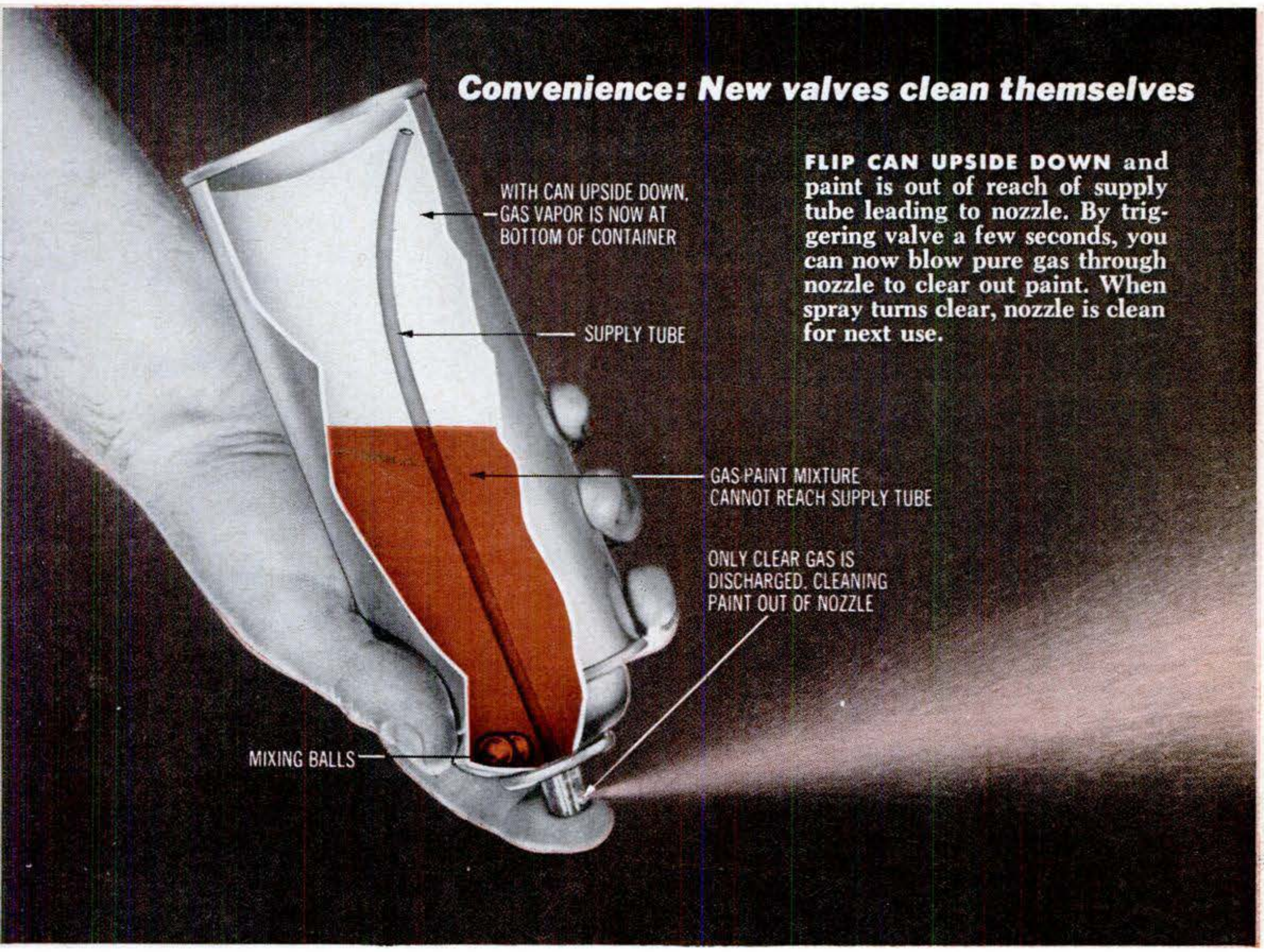

can a twirling motion after shaking. You should be able to clearly hear the mixing balls roll around the bottom of the can.

To avoid the chance of paint jamming the supply tube, start with a test spray on newspaper or scrap material. A can that has been standing for some time may give an intermittent spray for the first second or two before operating smoothly.

Spraying over other finishes. The solvents in some aerosol paints may tend to "lift" certain finishes over which they are applied. This is less likely if the existing finish is thoroughly dry and hard. To test, spray a wet coat from the aerosol on a small concealed area and allow it to dry. If it doesn't lift, you save the work of removing the old finish.

Tips on aerosol paint jobs. Where possible, do major jobs out of doors or in the basement or garage. If hard-to-move items require indoor spraying, keep doors and windows open for ventilation and cover nearby areas with newspapers or drop cloths to catch any over-spray.

If you're refinishing a freezer or refrigerator, it's wise to shut it off during the job to prevent over-spray from being drawn into the cooling coil. While the over-spray itself would do no harm, it can collect dust while tacky.

Touch-up trouble saver. For repairing scratches, chips or small worn areas, you can make an over-spray guard from an 8″-by-10″ piece of cardboard. Cut a center hole a little bigger than the area to be touched up. Hold the guard about half an inch from the work surface and spray through the hole onto the touch-up area.

Avoid false economy. As you near the end of a job, don't try to skin through on the last few drops in the can. Like a spray gun, the can may spit as it empties, spattering big droplets and marring an otherwise perfect job. You can tell when the can is about to run dry by the weight and feel when you shake it. Buy an extra, small can if you run out. You may want to touch up paint later and it will always be there when you need it. END

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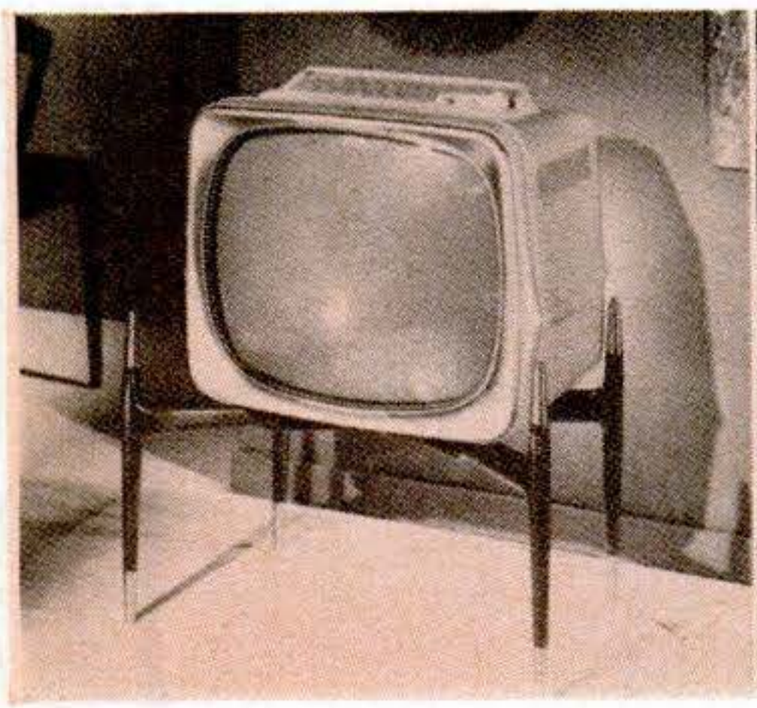

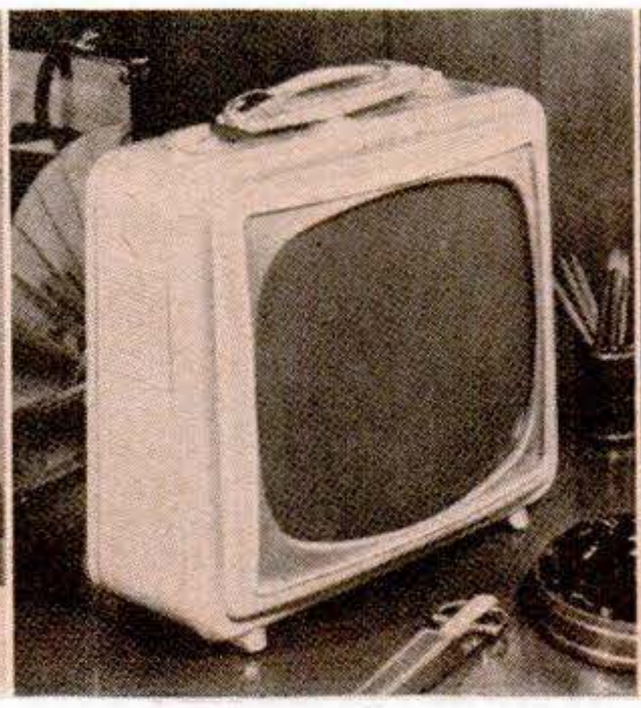

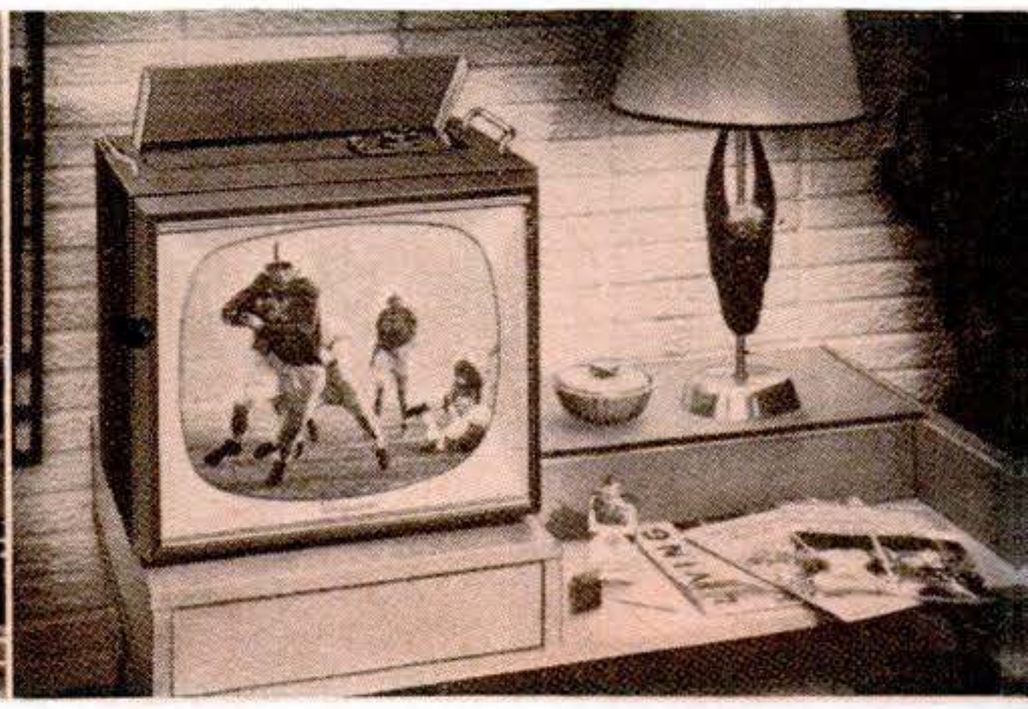

Buyer's Guide to the '59 TV Sets

By Hubert Luckett

KEEPING the serviceman away from your door is the idea behind some of the newest television sets. Underneath the smart, slim looks of the '59 models are some simple engineering features that may not seem as glamorous as the new styles. But they will be welcome to the man who foots the repair bills.

Main credit for the cut in repair costs goes to surge-limiting circuits. You'll find these in some models of most manufacturers. Slightly different versions are used with such proprietary names as: "Tube Sentry," "Tube Saver" or "Surgistor." They all work by cushioning the shock of the "in-rush" current into cold tubes when the set is switched on.

Premature tube failures may be reduced by 80 percent, RCA estimates, by allowing the tubes to warm up gradually before full power is applied. This can mean a significant saving in repair costs —according to one recent survey, tube failures account for almost 90 percent of all TV service calls. More durable components such as Mylar condensers, fin-cooled transformers and sturdier tubes share the credit for increased reliability in many of the new sets.

Some manufacturers prove their confidence in their new sets with extra guarantees. The standard offer up to now has been free replacement parts for three months (12 months on the picture tube) but no free labor. If a tube blew, you paid for the service call but not the new tube.

Now Motorola, Magnavox and Montgomery Ward have stretched the warranty on all parts to 12 months and throw in free labor for three months. RCA guarantees both parts and labor for three months.

Styling—the emphasis on an eye-catching package—is getting even more attention this year. The works inside have been pushed around a bit to accommodate the new skinny look, but the picture-producing circuits have become fairly standardized in the last three years. Many of the basic chassis are being carried over practically unchanged from previous models.

Here's a run-down on other news:

Looks. Philco's two-piece sets with separate picture tubes [PS, Aug.] are the most radical. Others, notably the GE Designer Series, are intended to give the TV set an attractive identity of its own rather than hiding it inside a conventional looking piece of furniture. The theme is the thin, slim look, with makers competing hotly to see who can claim the smallest front-to-back dimension.

Choice. Most of the makers are offering fewer models. The idea is to head off price increases by reducing extra tooling and inventory costs. But Zenith is bucking the fewer-models trend by offering even more than last year.

Convenience. The trend is toward re-

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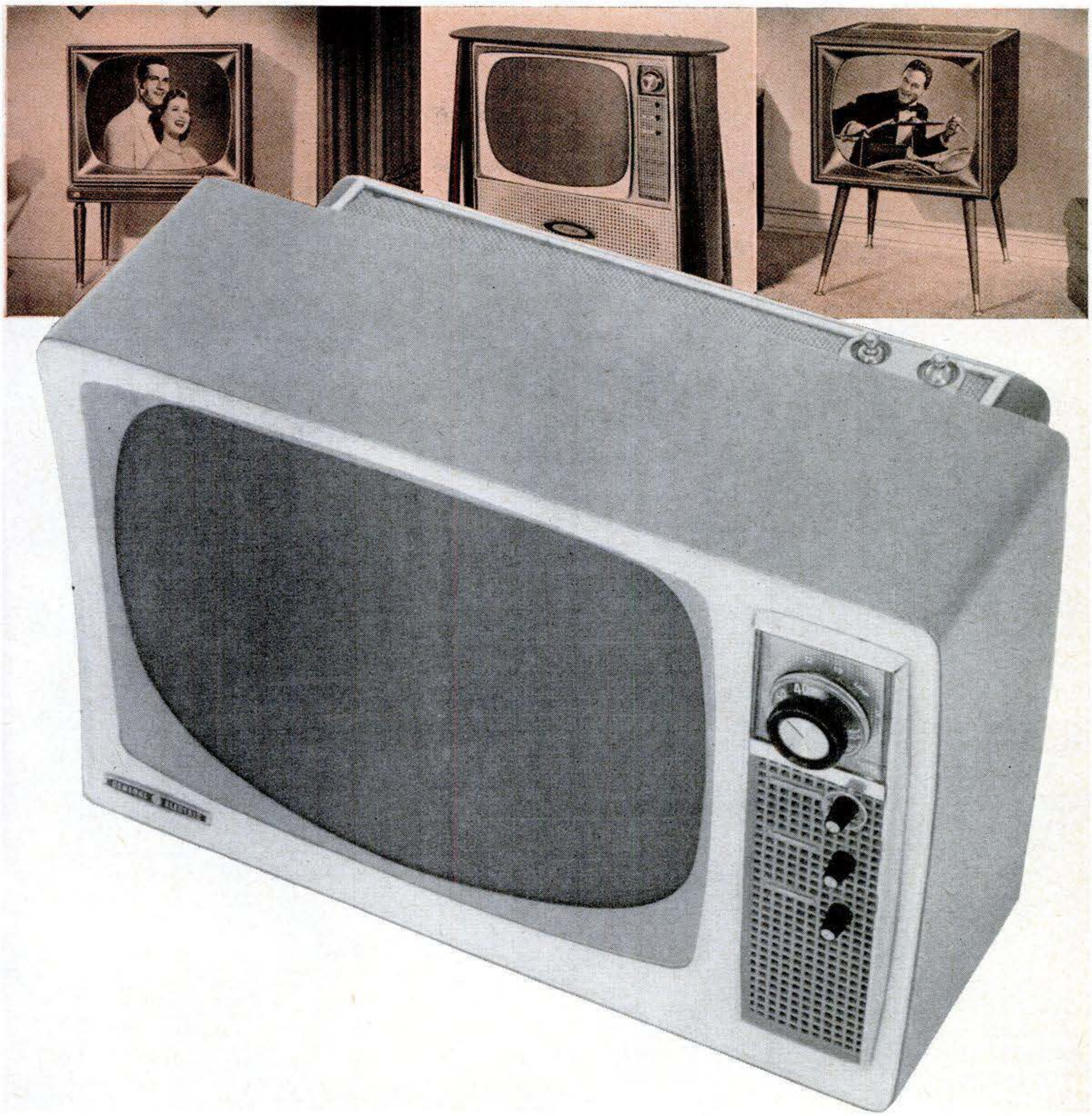

turning tuning controls to the front of the set so that you can see the picture while you make adjustments. Automatic fine tuning—you don't have to adjust for the best picture when you switch channels—shows up frequently on higher-priced sets. On RCA sets, each channel is adjusted when the set is installed; once tuned, it stays put. Off-on switches that don't affect the volume-control setting are becoming more popular. They eliminate going back to readjust volume after the set warms up.

Circuits. There seems to be a swing back to transformer-powered chassis—they are safer from electrical hazards and usually need less frequent repairs. This year there are transformers even in 14-inch portables (RCA's).

Price. Little change shows up. Among the sets listed in the PS chart, 21-inchers average only a bit higher than last year, 17-inchers a bit lower, suggesting that these big portables now get the role of price leader.

For the inside story on representative sets for '59—46 different chassis from 16 of the largest manufacturers—please turn the page.

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How to tell a good TV set

MANUFACTURER	CHASSIS	TYPE OF SET	APPROXIMATE PRICE	CABINET SIZE (ht. x w. x d. to nearest inch)	WEIGHT (lb.)
ADMIRAL	15C1	17″ port.	$120	14x17x14	42
	18A6t	21″	$190	21x24x15	88
	20B6C	21″	$320	38x29x16	121
EMERSON	120347H[b]	14″ port.	$168	12x14x15	28
	120428H	17″ port.	$128	13x16x17	37
	120434N[c]	21″	$228	19x26x17	69
GENERAL ELECTRIC	M4[c]	21″	$190	19x27x15	73
	U3	21″	$300	32x31x15	80
HOFFMAN	338	17″ port.	$180	13x17x13	29
	339	21″	$200	20x27x20	91
HOTPOINT	M4	21″	$190	19x27x15	73
	U3	21″	$300	20x29x15	80
MAGNAVOX	27 series	17″ port.	$175	15x18x16	50
	28 series	21″	$200	22x20x18	90
	29 series	21″	$260	32x23x20	90
MONTGOMERY WARD	4203	17″ port.	$120	16x14x15	39
	4202	17″ port.	$150	16x14x16	33
	5061	21″	$200	34x26x17	85
MOTOROLA	430	17″ port.	$155	14x17x16	37
	551	21″	$180	19x25x17	69
	544	21″	$200	20x28x17	84
PACKARD-BELL	V8-2	17″ port.	$170	14x16x13	45
	88-5	21″	$250	20x27x15	95
	98D4	21″	$330	20x30x17	105
PHILCO	9H25	17″ port.	$180	16x18x11	32
	9L41	21″	$190	19x25x18	75
	9L37	21″[f]	$260	27x20x15	57
RCA	KCS120A	14″ port.	$140	14x14x15	34
	KCS118A	17″ port.	$170	15x17x16	45
	KCS117A	21″ port.	$230	19x22x18	77
	KCS122A	21″	$190	19x24x16	73
	KCS121C	21″	$210	19x24x16	75
SEARS, ROEBUCK	528.50240	17″ port.	$130	15x18x17	35
	528.51222	21″ port.	$200	20x22x15	50
	528.51400	21″	$270	34x27x19	78
SETCHELL-CARLSON	C-105	17″ port.	$189	13x17x11	34
	159	21″	$389	36x26x18	79
SYLVANIA	537-5	17″ port.	$170	14x16x14	34
	540-5	21″	$220	17x21x14	50
	541-3	21″	$400	36x33x12	100
WESTING-HOUSE	V-2365	17″ port.	$160	14x15x16	30
	V-2366	21″	$200	21x24x19	75
	V-2372	21″	$240	21x24x16	72
ZENITH	15B20	17″ port.	$170	14x19x15	46
	17B20	21″	$190	20x24x18	n.s.
	19B20	21″	$250	20x24x18	n.s.

NOTES: [a] Or neutrode [b] Combination with AM radio

YOU can see the biggest change in TV this year without turning the set on—it's in the looks. Changes in the picture-producing circuits are slight. The chart at right gives manufacturers' specifications on portables, 21″ table models and, in a few cases, 21″ consolettes when a basic chassis type is not offered in a table model. Identification is by chassis number, since the same chassis may be used in many different models.

Picture tubes. Deflection angles are the biggest point of disagreement among set designers. Many experts still claim that you get less distortion and a clearer picture near the edges with the 90-degree tubes. The only reason for the 110-degree tube is to get a more compact package.

High voltage. It's the high voltage at normal beam current that counts—but it is the other figure you'll see advertised. The higher the voltage, the brighter the picture you'll get—other factors being equal.

I.F. amplifier. The amount of fine detail in the picture—the definition—is usually limited in practice by the intermediate-frequency amplifier (I.F.). More bandwidth means more detail. Theoretical maximum to get all the detail contained in the standard transmitted signal is 4.0 mc. To get enough bandwidth with only two I.F. stages usually means sacrificing some of the set's ability to pull in weak signals. Generally, the more stages and tuned circuits in the I.F., the better.

AGC (Automatic Gain Control). This circuit automatically adjusts the set to keep the picture contrast and brightness constant when signal strength varies. Keyed and amplified-derived types react more quickly and precisely to signal variations and are more immune to random interferences than the simple derived type. For example, they'll do a much better job of minimizing airplane flutter.

Filters. The more filters and the more kinds of filters, the less your picture is likely to be messed up by man-made interference or police, aircraft or ham radio transmissions.

Tuners. The cascode tuner, it is generally conceded, is still the most sensitive and noise-free for fringe-area reception. The neutrode and tetrode come next, and the pentode is the least sensitive.

Power supply. The transformerless type is cheaper and lighter, but has some drawbacks: (1) the chassis or metal cabinet may accidentally become electrically "hot," introducing some shock hazard; (2) if one

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	PICTURE-TUBE DEFLECTION ANGLE	HIGH VOLTAGE (KV—no beam current)	HIGH VOLTAGE (KV—normal beam current)	AUTOMATIC FINE TUNING	BUILT-IN ANTENNA	LOCATION OF TUNING CONTROLS	NUMBER OF I.F. AMPLIFIER STAGES	I.F. BANDWIDTH (megacycles)	NUMBER OF TUNED CIRCUITS IN I.F.	AGC TYPE	INTERFERENCE FILTERS	TUNER	TRANSFORMER POWER SUPPLY	POWER-SURGE LIMITING RESISTOR	OFF-ON SWITCH WITHOUT CHANGING VOLUME CONTROL	PRINTED CIRCUITS USED	NUMBER OF TUBE FUNCTIONS
	110°	15.5	14.4	no	yes	side	2	3.1	4	keyed	none	neutrode	no	yes	no	yes	18
	110°	18.0	17.0	no	yes	front	3	3.75	8	keyed	1 IF trap	cascode[a]	yes	no	yes	yes	20
	110°	20.0	19.0	no	yes	front	3	3.75	8	keyed	1 IF trap	cascode[a]	yes	no	yes	yes	21
	90°	13.0	11.5	no	yes	side	2	3.0	4	simple derived	1 IF trap	pentode	no	no	no	yes	18
	90°	13.0	11.5	no	yes	side	2	3.0	4	simple derived	1 IF trap	pentode	no	no	no	yes	18
	110°	16.0	13.0	no	yes	side	3	3.2	7	ampl. derived	2 IF traps	neutrode	yes	no	yes	yes	18
	110°	16.7	15.5	no	no	front	3	3.25	7	simple derived	1 IF trap	tetrode	yes	no	yes	yes	20
	110°	17.5	16.3	yes	yes	front	3	3.25	8	simple derived	1 IF trap	cascode	yes	no	yes	yes	21
	110°	16.5	14.5	no	yes	top	3	3.3	8	keyed	2 IF traps, 1 high pass	neutrode	no	yes	yes	no	19
	90°	18.0	17.0	no	yes	front	3	3.3	5	keyed		neutrode	yes	no	no	no	21
	110°	16.7	15.5	no	no	front	3	3.25	7	simple derived	1 IF trap	tetrode	yes	no	yes	yes	20
	110°	17.5	16.3	yes	yes	front	3	3.25	8	simple derived	1 IF trap	cascode	yes	no	yes	yes	21
	90°	14.0	13.0	no	yes	top	3	3.0	7	simple derived	1 IF trap, 1 high pass	neutrode	no	no	no	yes	19
	90°	18.0	17.0	no	yes	top	3	3.5	7	simple derived		neutrode	yes	no	yes	no	19
	90°	18.0	17.0	no	yes	top	3	3.5	7	keyed		neutrode	yes	no	yes	no	21
	90°	15.0	13.5	no	no	side	2	3.0	6	simple derived	1 IF trap, 1 FM trap	neutrode	no	yes	no	yes	16
	90°	14.2	11.0	no	yes	top	3	3.0	8	simple derived		neutrode	no	yes	no	yes	17
	90°	16.0	15.0	no	yes	front	2	3.4	7	simple derived		neutrode	no	yes	no	no	16
	90°	17.0	16.0	no	no	side	3	3.5	10	keyed	1 FM trap 1 high pass	cascode	no	no[e]	no	no	21
	90°	20.0	19.0	no	no	front	3	3.5	10	keyed		cascode	no	no[e]	no	no	21
	90°	20.0	19.0	opt.	no	front	3	3.5	10	keyed		cascode	no	yes	yes	no	21
	110°	13.0	12.3	no	yes	side	3	3.25	5	simple derived	1 IF trap	cascode	yes	yes	no	no	20
	110°	18.0	17.5	no	no	front	3	3.25	5	simple derived	1 IF trap	neutrode	yes	no	yes	no	20
	110°	18.0	17.5	no	no	remote	4	3.50	10	keyed	1 IF trap	neutrode	yes	no	no	no	26
	110°	15.5	14.0	no	yes	top	3	3.25	8	ampl. derived	1 IF trap	tetrode	no	yes	no	yes	18
	90°	17.0	15.5	no	yes	front	3	3.25	8	ampl. derived	1 IF trap	cascode	yes	no	yes	yes	20
	110°	17.0	15.5	no	yes	front	3	3.25	8	ampl. derived	3 IF traps	cascode	no	yes	yes	yes	20
	90°	13.0	11.5	no	no	side	3	3.2	6	simple derived	1 FM trap, 1 high pass, 2 IF traps	tetrode	yes	yes	no	yes	20
	110°	15.0	13.2	no	yes	side	3	3.2	6	simple derived		tetrode	yes	yes	no	yes	20
	110°	16.0	14.7	no	yes	side	3	3.2	6	keyed		cascode	yes	yes	yes	yes	22
	110°	16.0	14.2	no	yes	side	3	3.2	6	simple derived		cascode	yes	yes	yes	yes	22
	110°	18.0	17.5	no	yes	side	3	3.2	6	keyed		cascode	yes	yes	yes	yes	24
	90°	14.0	13.0	no	yes	side	2	3.0	6	simple derived	none	tetrode	no	no	no	yes	17
	110°	15.5	14.5	no	yes	top	3	3.2	7	keyed	none	tetrode	no	no	no	yes	19
	90°	18.5	17.5	no	yes	front	3	3.2	7	keyed	none	tetrode	no	no	yes	yes	20
	90°	15.0	14.0	no	yes	top	3	3.7	8	keyed	1 high pass	cascode	yes	yes	no	no	22
	90°	17.0	16.0	no	yes	front	3	3.8	11	keyed	1 high pass	cascode	yes	yes	yes	no	27
	110°	17.0	16.0	no	yes	top	3	3.15	8	keyed	none	tetrode	no	no	yes	yes	20
	110°	17.0	16.0	no	yes	front	3	3.15	8	keyed	none	tetrode	no	no	yes	yes	20
	110°	17.0	16.0	no	yes	top	3	3.15	8	keyed	none	cascode	no	no	yes	yes	21
	90°	14.0	12.5	no	no	side	3	3.35	8	simple derived	2 IF traps	tetrode[a]	no	yes	no	yes	16
	90°	15.0	13.5	no	yes	front	3	3.35	8	simple derived	2 IF traps	tetrode[a]	no	yes	yes	yes	19
	110°	17.0	15.5	yes	yes	front	3	3.35	9	keyed	2 IF traps	neutrode	no	yes	yes	yes	20
	90°	14.5	13.5	no	no	front	3	3.5	9	keyed	1 high pass	neutrode[g]	no	yes	yes	no	20
	90°	18.0	17.0	no	no	front	3	3.5	10	keyed	1 high pass	neutrode[g]	yes	no	yes	no	21
	90°	20.0	19.0	no	yes	front	3	3.5	10	keyed	1 high pass	cascode	yes	no	yes	no	22

[a] Same chassis available in 17" [d] Or standard [e] Tube heaters only [f] Picture tube separate [g] Or cascode

tube blows, they all go dark, making it difficult to spot the bad one.

Printed circuits. The use of printed circuits allows manufacturing economies and gives more uniform results in the sets coming off the production line. Their advantages from the manufacturing standpoint are attractive, and eventually all the manufacturers may switch over to them. But many servicemen don't like to work on them. They find repairs are often tedious and time-consuming. So you may find your repair bill somewhat higher than you expect if they have to dig into the printed-circuit boards.

Tube functions. This tells you the number of active electronic elements in the set; the more the better. High-voltage rectifier, low-voltage rectifier, damper tube, and picture tube are omitted from this count as they are common to all sets. END

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the latest for home and shop on

Home adhesives kit for sticking anything to anything, above, includes four general glues, contact cement, cold solder and three kinds of adhesive tape—all packed in a hang-up wall rack. LePage's sells it for about $4.

Another new adhesive makes it easy for anyone to mix two-part epoxy cement, which requires careful measurement. Cement and hardener come in two toothpaste-like tubes with different-size holes. You just squeeze out two ribbons of equal length, mix up the paste and the proportions come out exact. The epoxy cement, which bonds wood, metal, glass and many other materials, is sold by Smooth-On Mfg. Co. in 6- and 11-ounce tubes for $1.69 and $2.85 . . . You'll soon be seeing a new line of power tools called Hi-Lo, made by the Peninsula Tool Co. They'll include a saber saw at $64.95, a 3″ belt sander at $79.50 and an oscillating sander at $44.95. Among other selling points, the tools will feature famous-name components: GE motors and New Departure ball bearings . . . The problem of coloring moldings and other solid lumber to match prefinished plywood has been simplified by U. S. Plywood. Trim stains and putty sticks

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for hiding nailheads are now available in 16 colors that correspond exactly to those of prefinished plywood panels.

All-purpose rack at right, only 12″ wide, can hold more than 50 types of tools or kitchen utensils in an unusual arrangement of holes, hooks and slots. Made of heavy-gauge steel, it's sold by Ashley's for $1.49.

Closet poles with sliding hooks for coat hangers make it easier to push clothes aside and keep them neatly hung. The metal poles, made by Macklanburg-Duncan, come in 3′ to 8′ lengths for about $3.50 to $10 . . . "Plastic" porcelain, by Woodhill, now comes in a squeeze tube for quick touch-up of white sinks and refrigerators for $1.

Neat storage: Plastic jars for small parts, at right, have hooks on top (welded to the cap) to fit perforated board. Stelco sells a set of six for about $2.

Midget pocket-size version of Channellock pliers, only 6½″ long, is now available. Made by Champion DeArment, the pliers open to ⅞″ in five steps, sell for $2.30.

New all-steel hammers may indicate a popular trend. Latest is Estwing's sleek one-piece design at right, featuring a molded-on plastic grip and a nail-holding claw that lets you use the hammer one-handed. It comes in 12-, 16- and 20-ounce weights for $5.25 to $5.45.

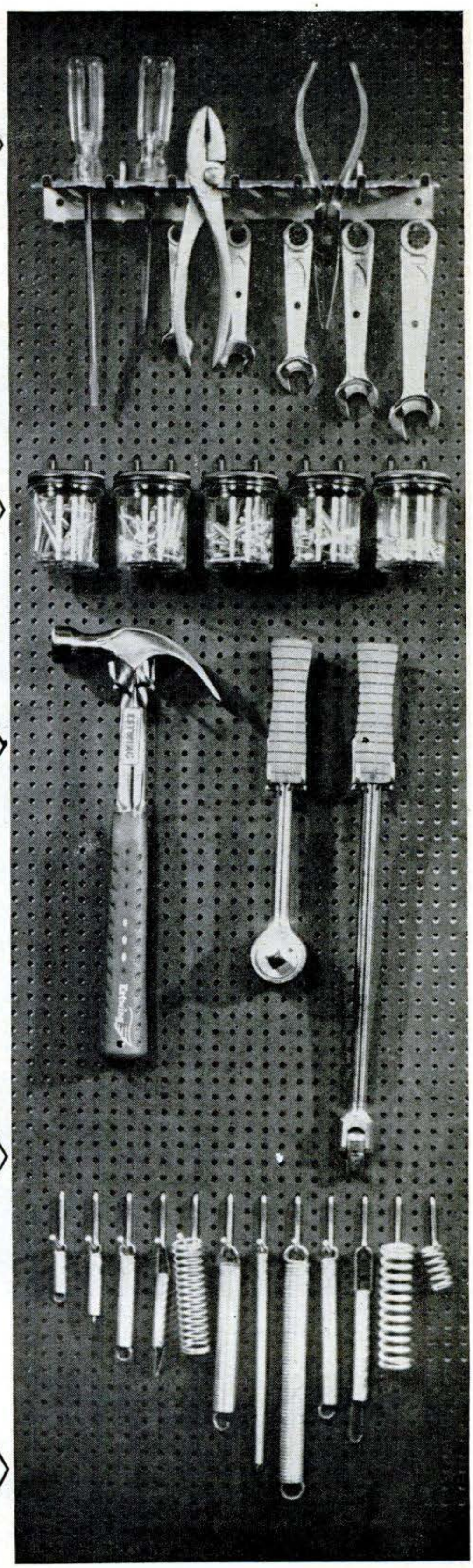
the PS toolboard

Other makers of steel hammers include Stanley and True Temper—with one switch: an unbreakable fiber-glass handle made by Plumb.

Trend toward more comfort and styling in tools is indicated by new Penens socket wrenches (far right beyond hammer). Both ½″ ratchet and hinge drives have soft, bright green grips to cushion shock—and look pretty.

Further evidence of the growing popularity of socket wrenches around the home: Cummins' ¼″ electric drill now comes in an unusual 50-piece tool kit that includes a complete socket-wrench set and other accessories designed to aid home and auto upkeep. Price: $34.95.

Those hard-to-find coil springs will soon be seen in local hardware stores. A selection of 70 different types and sizes, a few of which are shown at right, will be sold by Admiral for about 15 to 85 cents apiece.



Please turn the page for more new products

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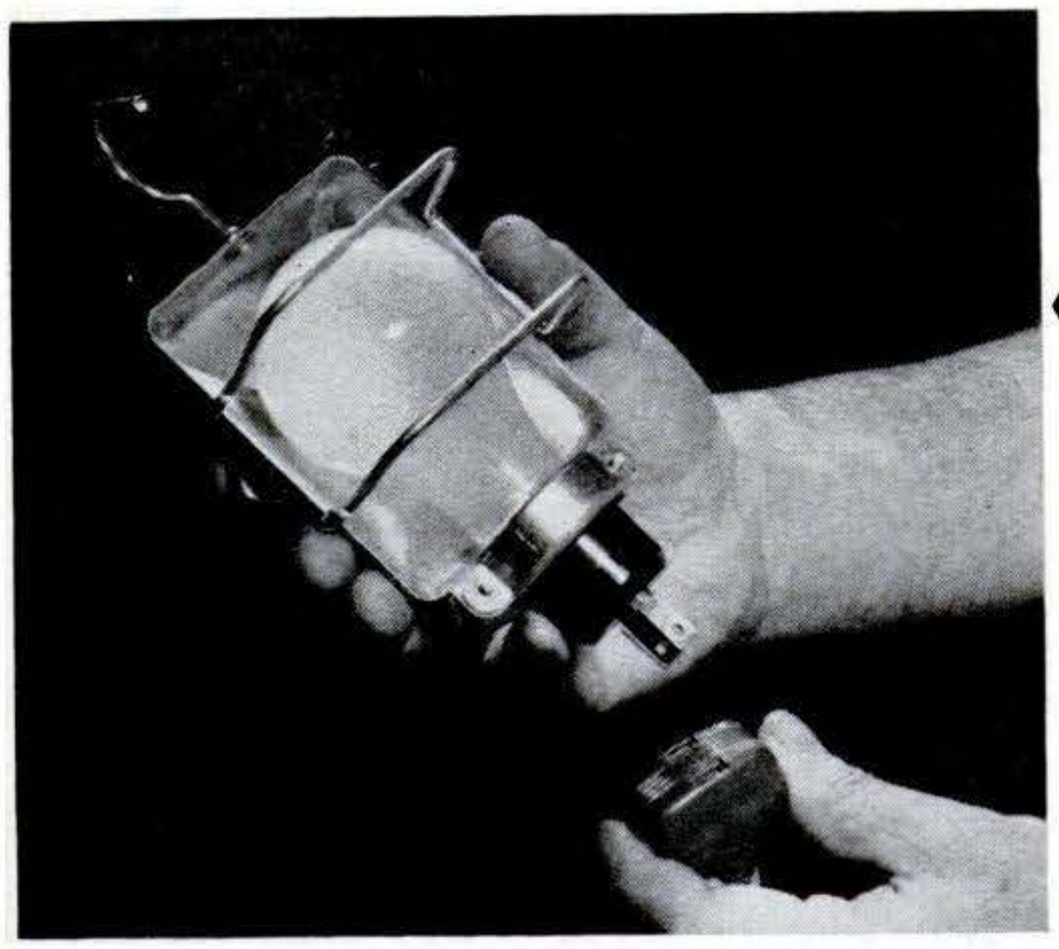
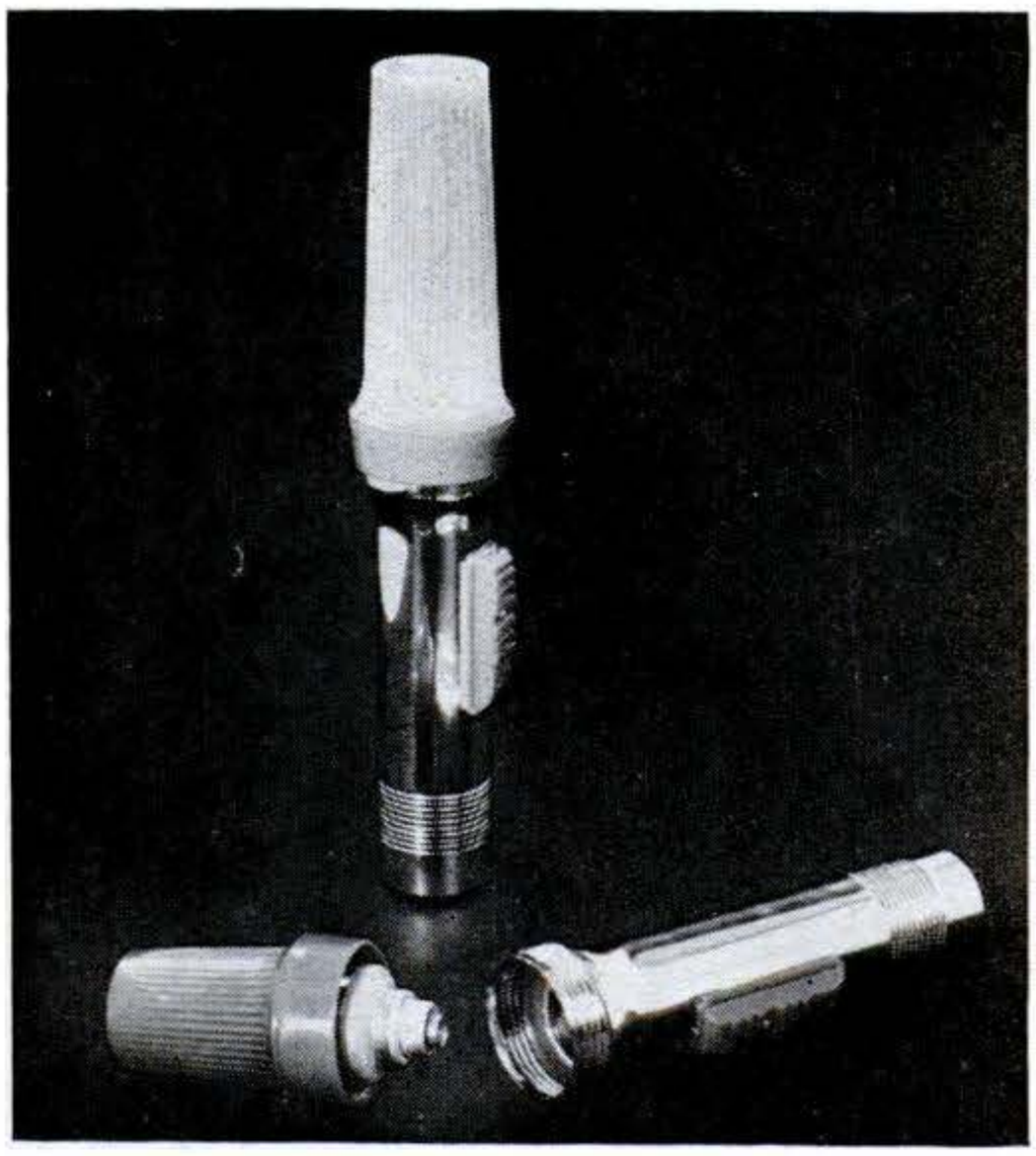
what's new for the family car

Latest substitute for your engine's cooling fan is a pair of tiny electrically driven fans that mount ahead of the radiator and blow cool air through it. Disconnecting the main fan, needed only at slow speeds, is said to add eight to 15 hp. and cut fuel consumption 10 to 15 percent. The new fans, sold by Everhot Products, are thermostatically controlled to cut in at 185° and off at 165° . . . New Hub-O-Matic adjustable wheel balances mount permanently on your car. A metal ring is first bolted to the wheel hub, then sliding weights are clamped around the ring at appropriate points for proper balance.



New GE plug-in bulb holder, at left, turns any ordinary extension cord into an inexpensive hang-up work light.

A bumper jack with tripod legs, instead of the usual single upright bar, is said to eliminate the danger of the car's slipping off on soft or uneven ground. It's sold by Universal Tool and Stamping Co. for $10.56 . . . Tiny window louvers for cold-weather driving let in just enough air to keep your car safely ventilated without chilling the inside. Sold by Brekke Distributors, the perforated metal strips slip over the top of the side windows . . . Rubber-headed mallet with a hook on the handle makes it easy to pry off hub caps, then tap them gently back on. John Bean makes it.



Those long red-nosed flashlights that police use, at left, are now available to motorists, campers and others who want a signal light as well as a conventional white beam. National Carbon sells two models, one with a 5″ red plastic hood for $1.39, one with a 3″ hood for $1.29.

Special polish for hard-to-shine metals like the stainless steel on auto hubcaps, chrome trim, and aluminum is now available from Ge-Halin Products.

Sheldon Gallager

for more information:

Here's where to write if you can't get any item listed: **Admiral Spring & Mfg. Co.,** *799 Broadway, NYC 3;* **Ashley's,** *W. Huron River Dr., Belleville, Mich.;* **John Bean Div.,** *Box 840, Lansing, Mich.;* **Brekke Dist.,** *Bozeman, Mont.;* **Champion DeArment Tool Co.,** *Meadville, Pa.;* **Cummins Portable Power Tool Co.,** *Milwaukee;* **Estwing Mfg. Co.,** *Rockford, Ill.;* **Everhot Products Co.,** *2001-09 W. Carroll Ave., Chicago;* **Ge-Halin Products,** *277 Broadway, NYC 7;* **General Electric,** *Providence, R. I.;* **Hub-O-Matic, Inc.,** *W. 503 Indiana, Spokane, Wash.;* **LePage's, Inc.,** *40 Swanson St., Gloucester, Mass.;* **Macklanburg-Duncan Co.,** *Box 1197, Oklahoma City, Okla.;* **National Carbon Co.,** *535 5th Ave., NYC 17;* **Penens Tool Corp.,** *Schiller Park, Ill.;* **Peninsula Tool Co.,** *1200 34th Ave., Menominee, Mich.;* **Fayette R. Plumb,** *Philadelphia 37;* **Smooth-On Mfg. Co.,** *570 Communipaw Ave., Jersey City 4, N. J.;* **Stanley Tools,** *111 Elm St., New Britain, Conn.;* **Stelco Mfg. Co.,** *972 Broad St., Newark 2, N. J.;* **True Temper,** *1623 Euclid Ave., Cleveland 15;* **Universal Tool and Stamping Co.,** *Butler, Ind.;* **United States Plywood Corp.,** *55 W. 44th St., NYC 36;* **Woodhill Chemical Co.,** *Cleveland.*

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what's new in cabinet hardware

Looking for knobs and pulls designed especially for modern-style cabinets and drawers? Here are some of the latest. They come in brass, bronze, chrome and colors, some with matching hinges. Makers include Amerock, Faultless, Stanley, Yoder and National Lock.

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DISSTON *Dagger* Electric Sabre Saw

- **Cuts faster** with *exclusive* Orbite Action—blade cuts on upstroke, backs away on downstroke. Reduces fraying, blade wear, and need for finish sanding.
- **More cutting power**—because it has the highest output horsepower. 2.75 ampere motor drives it at 3600 strokes per minute.
- **Rips, crosscuts, miters, bevels, scrolls, and plunge cuts** without need for drilled hole. Cuts hardwood 2x4s at 45° angle.
- **Cuts wood, metals and plastics.**
- **Exclusive** conventional saw handle for easier handling and more comfortable grip.

With 10′ detachable cord **$54.50**

DISSTON *Dauntless* Electric Sabre Saw

—industrial-capacity sabre saw for professional and heavy-duty use **$98.50**

Why these new DISSTONS

BECAUSE they're the hottest new products on the power saw market. Engineered for extra power...extra capacity. There's no overheating . . . no faltering . . . when you run into rough material. Disston built these saws to be tough, rugged workhorses.

BECAUSE they're precision-built for ease of handling. Grip the comfortable, conventional saw handle. Notice immediately Disston's light weight and perfect balance. It's easy to push . . . easy to lift . . . a Disston Power Saw. It's designed and built by craftsmen for the use of other craftsmen.

BECAUSE years of experience in fine tool making have gone into the design and production of Disston Power Saws. Disston craftsmen have created the world's finest hand saws. (Just ask any carpenter.) Now, they offer you a line of power saws possessing features unknown to other makes.

BECAUSE *exclusive* "Life-Saver" Cords provide added safety features. They are 3-wire cables to provide ground protection. Your Disston Power Saw can be kept separated from the detachable cord, preventing children from operating the saw.

BECAUSE you've got power, capacity, balance, and light weight expertly combined in one line of power saws by saw craftsmen...whose skill and experience have made Disston the world's most famous name in fine tools. *Disston Division, H. K. Porter Company, Inc., Phila. 35, Pa.*

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DISSTON *Discus* Circular Saw

- **6½″ blade**—cuts 2³⁄₁₆″ at 90°, a full 1⅞″ at 45°.
- **10-ampere rating.**
- **6300 Surface Feet Per Minute** cutting speed—up to 1000 S.F.P.M. more than other saws in the same blade diameter.
- **Positive slip clutch** eliminates kickback and motor burnout.
- **Convenient, easy-to-use levers** control angle of cut from 0° to 45°.

With 10′ detachable cord **$54.50**

DISSTON *Defender* Circular Saw

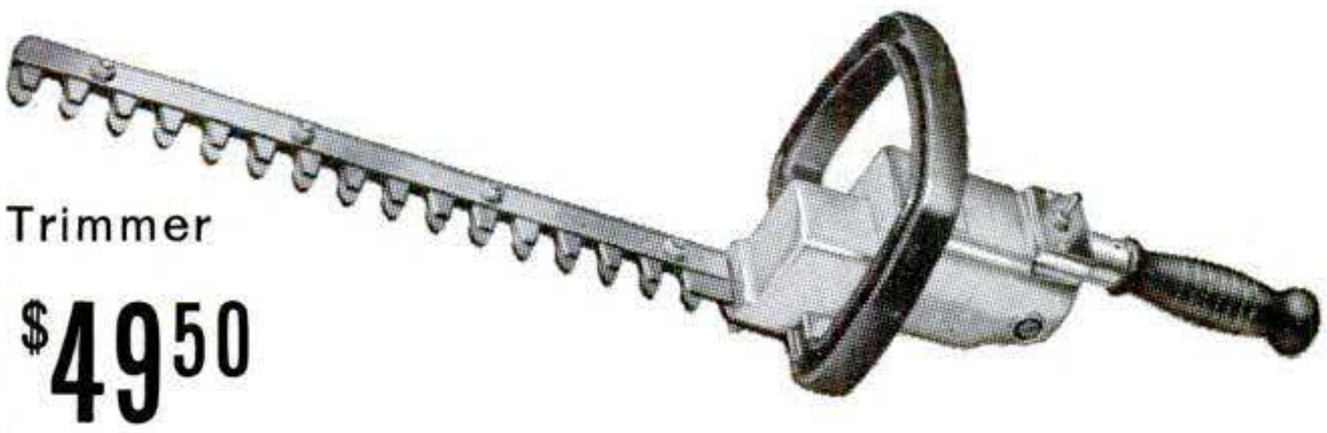
For heavy-duty and professional use. Ballbearing. 6½″ blade **$69.50**

are your best power-saw buy!

NEW DISSTON DRAGON

Electric Hedge and Shrubbery Trimmer

with exclusive fixed all-position handle. Exclusive plug-in cord set. Cuts hedge trimming time to a tenth. 1800 cutting strokes per minute. **$49.50**



Disston . . . A World Famous Name in Tools

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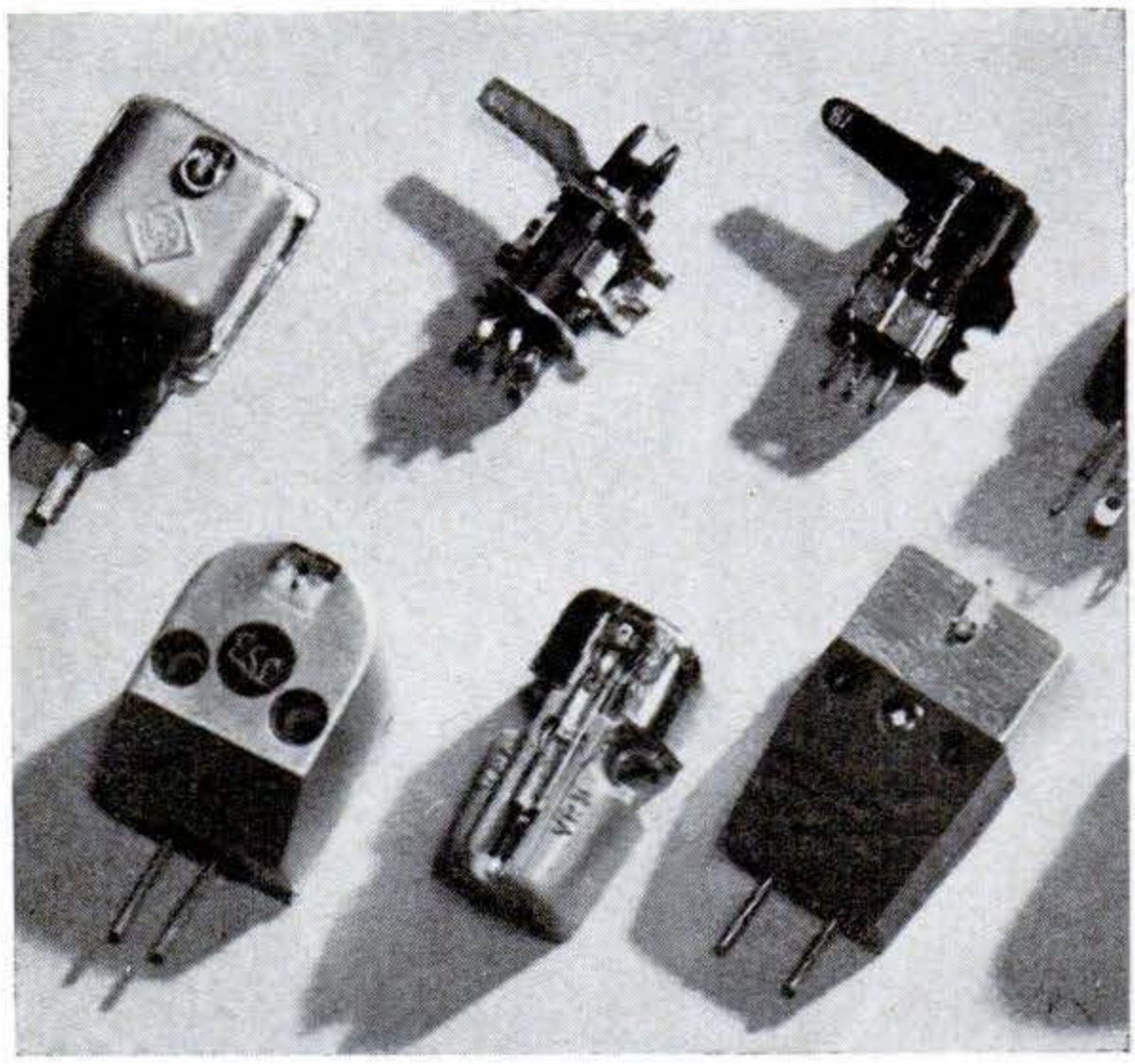
Rapid changes are occurring in the field of high-fidelity because of the trend to stereo. To help you get the facts straight, Popular Science here

Hi-Fi and Electronics

Stereo Pickups Are the Big Hi-Fi News



By R. S. Lanier

THE pickup is the brain of any hi-fi record player. Amplifiers furnish the muscle, and loudspeakers are the tools that actually make the sound you hear, but neither can do any better than the pickup tells it to. No wonder a good pickup costs more for its size than any other unit in your hi-fi system. It's worth it in terms of better sound and longer record life.

Pickups are a lot smarter than they were only a year or so ago. Not only have the standard pickups been improved, but there are the new stereo pickups that are mainly responsible for the latest sensation sweeping the hi-fi world—three-dimensional sound.

We listened to the new stereo pickups and to the latest monophonic (that's the experts' new word for monaural) units; and we also invited the manufacturers to answer a questionnaire. From these answers were compiled the performance figures in the chart printed with this article. Highlights of our findings:

- If you want to play stereo records, you *must* have a stereo cartridge, even though you are not ready to add the second amplifier and speaker for stereo sound. You can hear the stereo records monophonically—using one amplifier and speaker—with a stereo cartridge, but a standard pickup will ruin them after only a few plays.
- You *can* play your standard records with a stereo pickup. The output is likely to be less—so much less with some stereo pickups that you may not be able to turn up the volume far enough without getting too much hum.
- Your standard records may sound better with a stereo pickup than with some standard pickups.
- Stereo units are not quite up to the low record-wear and distortion standards of the top-quality monophonic pickups of

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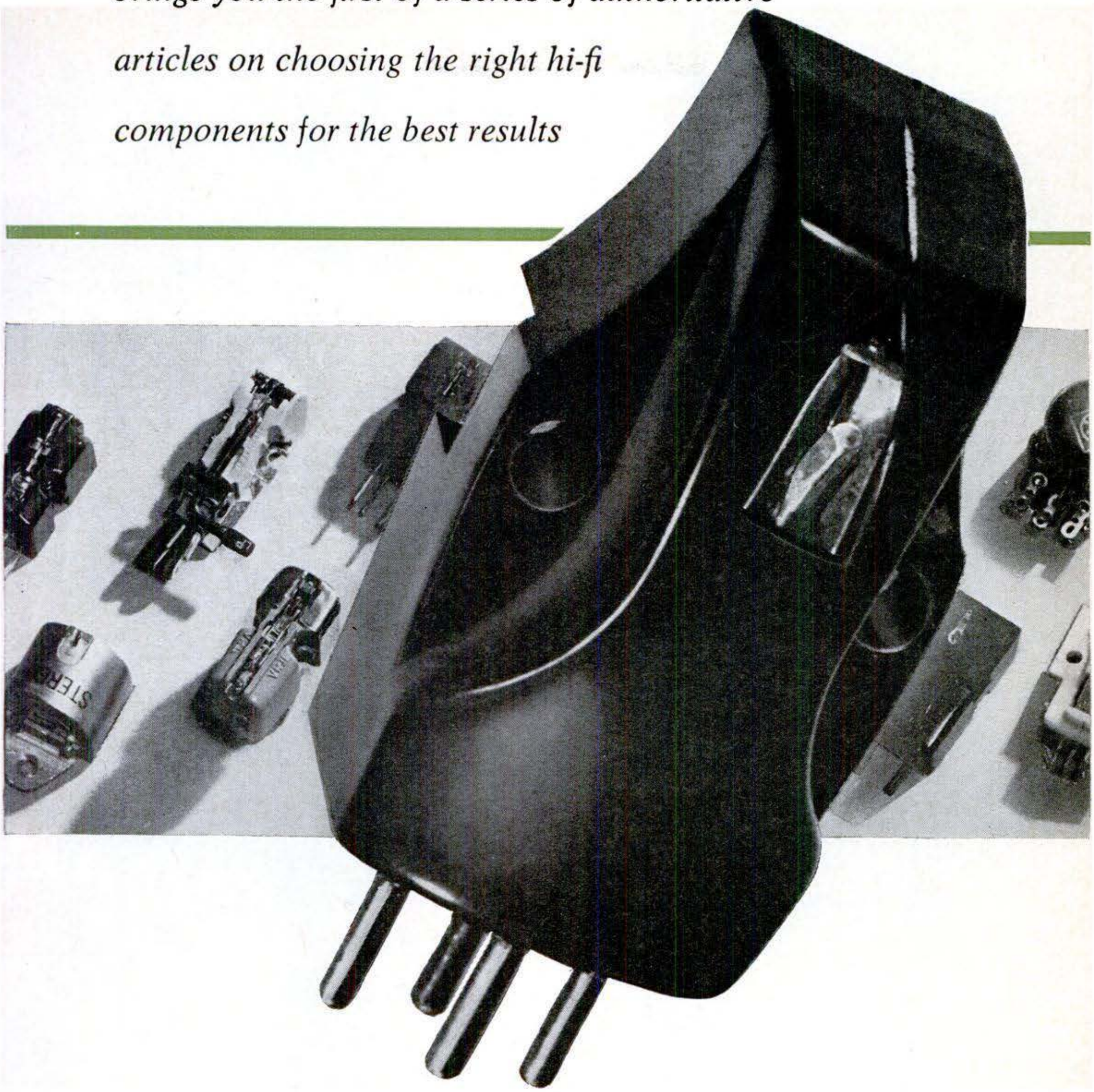
brings you the first of a series of authoritative articles on choosing the right hi-fi components for the best results



today. But many have already surpassed what were considered top-quality cartridges just a few years ago.

- The sharper stylus point used with stereo records, and the delicacy of the stereo groove, impose some new requirements on choice, installation and use.
- Stereo pickups are generally more sensitive to turntable rumble and they are fussier about precise tone-arm tracking. Consequently many record changers now in use are unsatisfactory for use with the stereo pickup.

The pickup's job. Let's look at the engineering trick the stereo pickup has to pull off. Tiny hills and valleys laid out along one side of the V-shaped stereo groove represent one sound channel; and those on the other wall, the other channel. The stylus rides up and down along an imaginary line inclined at 45 degrees to the record surface—either to the right or left depending on which groove wall presents a hill or a valley.

The pickup must produce two electrical signals, one that goes up and down like the hills and valleys in the left wall of the groove, and one that follows the variations in the right wall of the groove. Two electrical generators in the pickup do this,

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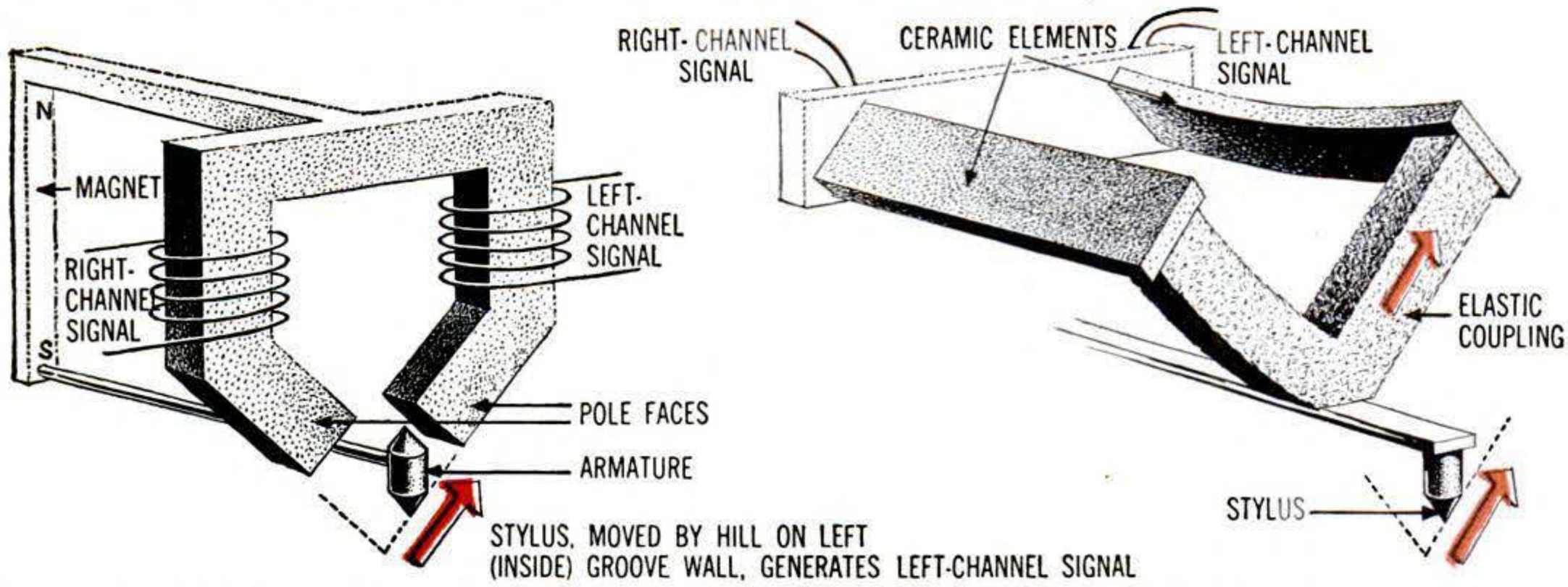
New Stereo and Standard Pickups: FACTS AND FIGURES

MANUFACTURER	MODEL	PRICE	TYPE	OUTPUT VOLTAGE (millivolts)	FREQUENCY RESPONSE (c.p.s.)	VERTICAL TRACKING FORCE (grams)	
						Arm	Changer
ASTATIC	Mono 89TBX	$18.00	ceramic	1300	30-15K±2db	6	6
	Stereo 13TBX	$20.50	ceramic	500	20-15K±2db	6	6
AUDIOGERSH	Mono MST-1	$26.50	moving iron	27	30-19K±4db	5-7	7-8
	Stereo 200	$59.50	moving magnet	12.5	30-18K±2db	4-6	4-6
COLUMBIA	Stereo SC-1	$21.75	ceramic	400	30-16K±2.5db	5	7
ELECTROSONIC LAB.	Mono C-60	$39.50	moving coil	5	18-20K±2db	2	n.r.
	Mono P-60	$49.50	moving coil	5		2	n.r.
	Stereo C-100	$69.95	moving coil	1		2	n.r.
	Stereo P-100	$79.95	moving coil	1		2	n.r.
ELECTRO-VOICE	Stereo 21D	$19.50	ceramic	500	20-15K±2db	4	6
FAIRCHILD	Mono 225A	$37.50	moving coil	n.a.	20-20K±2db	3-6	6
	Mono 230Mic. 7	$42.50	moving coil	n.a.	n.a.	4	n.r.
	Stereo 232	$49.50	moving coil	n.a.	10-20K	4	4
FENTONE	Mono BOS-MG-A	$36.25	moving magnet	30	20-16K±2db	n.a.	
GENERAL ELECTRIC	Mono 4G-061	$17.95	moving iron	10	20-15K±2db	4-6	6-8
	Mono 4G-052	$19.95	moving iron	10	20-15K±2db	4-6	6-8
	Stereo GC-7	$23.95	moving iron	6	20-17K±2db	3-7	3-7
	Stereo GC-5	$26.95	moving iron	6	20-20K±2db	2-4	n.r.
GRADO	Mono	$45.00	moving coil	3	10-28K	4	4
	Stereo	$49.50	moving coil	3	10-35K	2	4
NORELCO	Mono	$29.00	moving magnet	17.5	10-20K±2db	5	5
PICKERING	Stereo 371	$29.85	moving iron	8	20-15K±2db	2-4	4-6
RONETTE	Mono TO-284-OV	$ 9.90	crystal	700	30-13K±2.5db	4-6	a
	Mono TX-88	$18.33	crystal	600	30-24K±3db	2-4	a
	Stereo BF-40	$18.60	crystal	400	30-15K±2db	2-4	a
	Stereo OV	$19.45	crystal	400	30-15K±2db	2-4	a
SHURE	Mono M5D	$27.50	moving magnet	10.5	20-20K±2db	3-5	5-7
	Stereo M3D	$45.00	moving magnet	5	20-15K±3db	3-5	4-6
SONOTONE	Mono 7T	$22.50	ceramic	600	20-12K±2db	5-7	7-9
	Mono 3T	$22.50	ceramic	500	20-15K±1.5db	4-6	6-8
	Stereo 8T	$24.50	ceramic	300	20-12K±1.5db	4-6	6-8
	Stereo 8T4	$24.50	ceramic	300	20-12K±1.5db	4-6	6-8

NOTES: n.a.: Figure not available from manufacturer n.r.: Not recommended a: Lowest force that will trip the changer

Three types of stereo pickups—and how they work



MOVING-IRON PICKUPS generate signal in fixed coils by varying gap in magnetic circuit. Armature carries flux more strongly to the pole it approaches. Forty-five-degree pole faces provide unvarying distance from one pole when armature approaches other along 45-degree line.

CERAMIC UNIT elements have flat sides at right angles to each other, and 45 degrees to record. Each element bends easily in its narrow dimension. Flexible material carries stylus push if it is at right angles to flat side but not if it is parallel. Bending ceramic element produces signal.

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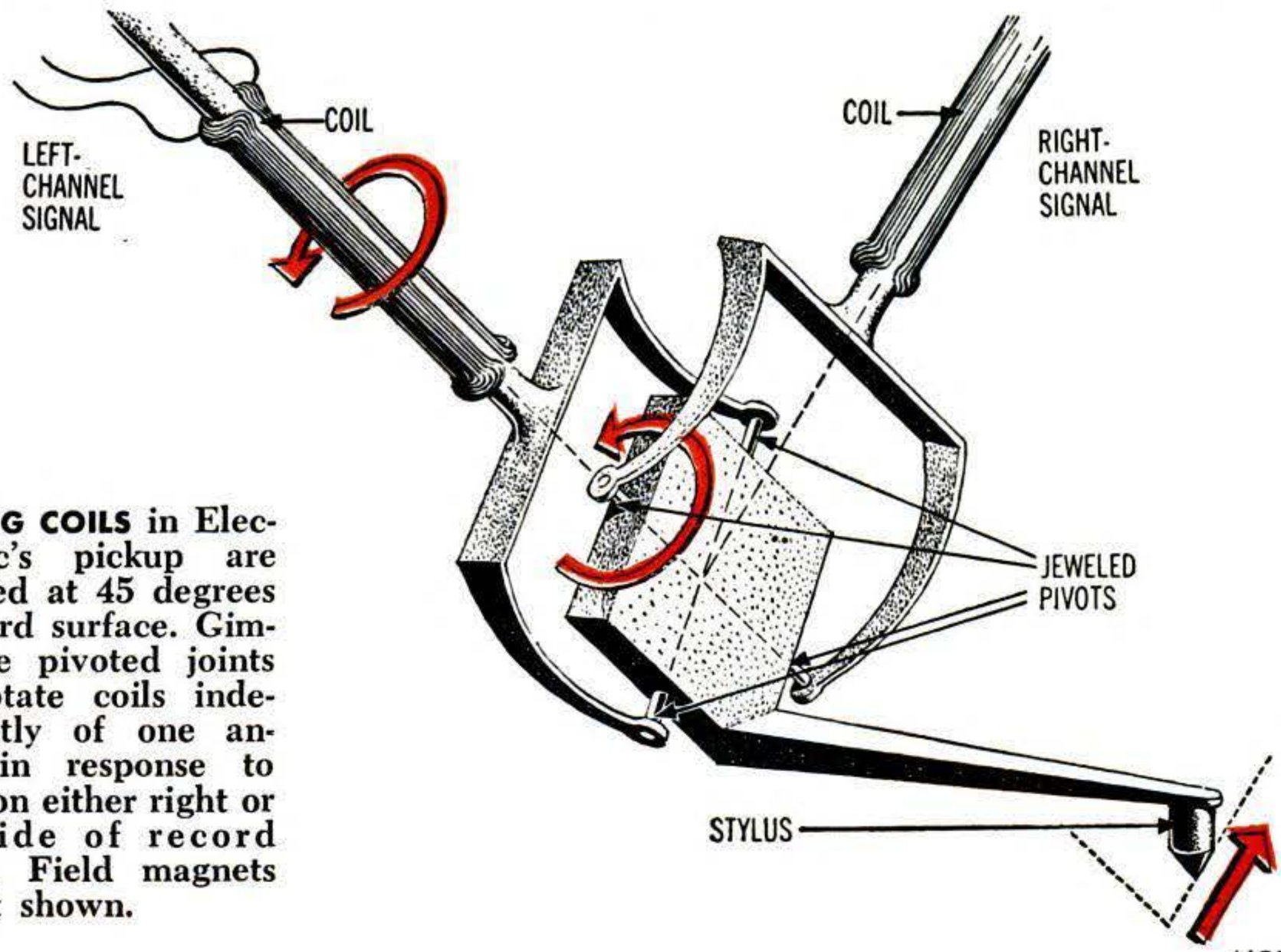
COMPLIANCE (cm/dyne x 10^{-6})		STYLUS RADIUS, LP or STEREO (inches)	CAN STYLUS BE REPLACED BY USER?	COST OF REPLACEMENT STYLUS (diamond)	DYNAMIC MASS (milligrams)	RECOMMENDED LOAD (ohms)	INTERNAL INDUCTANCE (millihenries, each channel)	INTERNAL RESISTANCE (ohms)	MINIMUM CHANNEL SEPARATION AT 1,000 C.P.S., STEREO ONLY (db)	NUMBER OF TERMINALS	WEIGHT OF CARTRIDGE (grams)
Lateral	Vertical										
2.3	0.6	.001	yes	$17.50	20	2 meg.	—	—	—	2	2.8
2	2	.0007	yes	$19.50	13	2 meg.	—	—	25	4	2.8
5.1	2.2	.001	yes	$16.50	3.1	47K	385	1400	—	—	n.a.
4	4	.0007	yes	$26.50	n.a.	37K	n.a.	n.a.	20	3	n.a.
2	2	.0008	n.r.	n.a.	3	1 meg.	—	—	20	3	5.5
6.8	1.5	.001	no	$20.00	1	5K up	1	39	—	—	12
6.8	1.5	.001	no	$20.00	1	5K up	1	39	—	—	30
5	5	.0007	no	$25.00	2	47K	.6	24	20	3	25
5	5	.0007	no	$25.00	2	47K	.6	24	20	3	30
2	2	.0007	yes	$ 9.90	3.5	3 meg.	—	—	25	3	2.4
n.a.	n.a.	.001	no	n.a.	n.a.	5K up	1.5	180	—	—	12
n.a.	n.a.	.0007	no	n.a.	n.a.	5K up	3.2	400	—	—	10
6	6	.0006	no	n.a.	n.a.	5K up	4	600	25	4	12
5	n.a.		yes	$23.75	3	100K	105	350	—	2	n.a.
1.7	.5	.001	yes	$ 9.95	4	100K	520	600	—	—	8
1.7	.5	.001	yes	$ 9.95	4	100K	520	600	—	—	9.5
3	2	.0007	yes	$ 9.95	2	100K	500	2200	20	4	10
4	2.5	.0005	yes	$11.95	2	100K	500	2200	20	4	10
15	n.a.	.0007	no	$15.00	1.8	5K up	n.a.	600	—	2	15
8	n.a.	.0007	no	$20.00	1	5K up	n.a.	600	25	4	17
5	n.a.	.001	yes	n.a.	2.8	68K	600	1200	—	2	n.a.
4-6	4-6	.0007	yes	$18.00	n.a.	27K	600	3000	24	4	9
2.2	.19	.001	yes	$ 4.00	8	1 meg.	—	—	—	—	n.a.
5	.35	.001	yes	$10.83	3	1 meg.	—	—	—	—	n.a.
3.5	3.5	.00075	yes	$ 4.00	n.a.	1 meg.	—	—	24	4	n.a.
3	3	.00075	yes	$ 4.00	n.a.	1 meg.	—	—	24	4	n.a.
3	1.25	.001	yes	$16.50	1.7	27K	400	440	—	2	12.4
4	4	.0007	yes	$22.50	2	47K	400	400	20	4	8.5
1.6	1.4	.001	yes	$16.50	10	2.2 meg.	—	—	—	2	4.5
2	2	.001	yes	$16.50	8	2.2 meg.	—	—	—	2	12
2.4	2.4	.0007	yes	$16.50	10	2.2 meg.	—	—	20	3	7
2.4	2.4	.0007	yes	$16.50	10	2.2 meg.	—	—	20	4	7



MOVING COILS in Electrosonic's pickup are arranged at 45 degrees to record surface. Gimbal-type pivoted joints will rotate coils independently of one another in response to signal on either right or left side of record groove. Field magnets are not shown.

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one "sensing" the portion ("component" in engineering terms) of the stylus motion produced by the left wall, the other sensing the part of the motion caused by the right wall.

The extent to which one generator keeps clear of motions intended for the other is the "separation" of the pickup, one of its most important qualities. Separation of 20 db, fairly standard, means that the spurious sound produced by the right generator from motions intended for the left one is 20 db weaker than the honest right-hand sound. This seems to be plenty for full stereo effects.

Designing the pickup. Getting two separate signals out of a single record groove multiplies the problems of pickup design. The major difficulties:

Dynamic mass. The lighter the parts that must move with the stylus, the better. But more "hardware" is generally needed to drive the two generators in a stereo pickup.

Tracing distortion. Always present to some degree because the spherical stylus tip doesn't exactly duplicate the motions of the cutter in following the record groove, the problem is greater with stereo. So a sharper stylus is needed. Tip radius is reduced from one mil to .5 to .7 mils.

Vertical tracking force. A lighter touch is needed to keep the sharper stylus from gouging the record. Over four grams is likely to damage the stereo groove.

Compliance. The springy support that holds the stylus must be easier to move (less stiff) in both vertical and horizontal directions. A stiffer suspension requires more force to hold the stylus in contact with the record groove.

These are the factors at the heart of the problem of making a stereo pickup that will match the best of the standard pickups in low record wear, wide frequency response and low distortion. A study of the chart will show that in nearly all cases the stereo units fall short of the best standard pickups by having less compliance, or more dynamic mass or, usually, both.

Will stereo pickups get better? No doubt about it. Minor improvements are being made right along and are being incorporated as running changes in production units. Totally new inventions in the design of stereo pickups may be in the offing. But many experts have expressed doubt that any pickup based on the present stereo system will ever match, in the four important respects outlined above, the best standard monophonic unit that can be made.

Fortunately we don't have to wait for the unattainable ideal pickup. The stereo effect is itself so overwhelming in its realism that the listener is not usually concious of the shortcomings.

Of the pickups we listened to, the stereo ceramics all sounded much better, even on standard LPs, than typical ceramic monophonic pickups of a year ago. On average-quality stereo-reproducing equipment, there was little choice, as to listening quality, between the units tested—ceramic or magnetic. In fact, there was so little difference in the stereo sound heard on an average system that many buyers will probably make their choice on the basis of probable record wear and the way a pickup plays standard LPs.

There is a little different story when top-quality reproducing equipment is used throughout. The Electrosonic stood out for clean sound and excellent definition. The Shure was very smooth, and the Pickering was attractive for excellent sound, moderate price and nearly foolproof construction. Among the ceramics, the CBS and Sonotone sounded particularly smooth.

Installation. Here are a couple of points to watch in installing any pickup. They're doubly important with stereo.

- The pickup must be exactly parallel to the record surface. Many pickups have a vertical line on the front of the case to help with this adjustment.
- Adjust the tracking force to the minimum that will keep the stylus in the groove when playing the loudest full orchestra recording you have. If more force than the manufacturer recommends is needed, check your tone arm for freedom of movement and your turntable for accurate leveling.

Today's situation? We have some wonderful monophonic pickups, but the future belongs to stereo. In this period of rapid change, it may be best to keep two pickup arms on your outfit—one for monophonic listening, one for stereo. END

Next Month: All About FM Tuners

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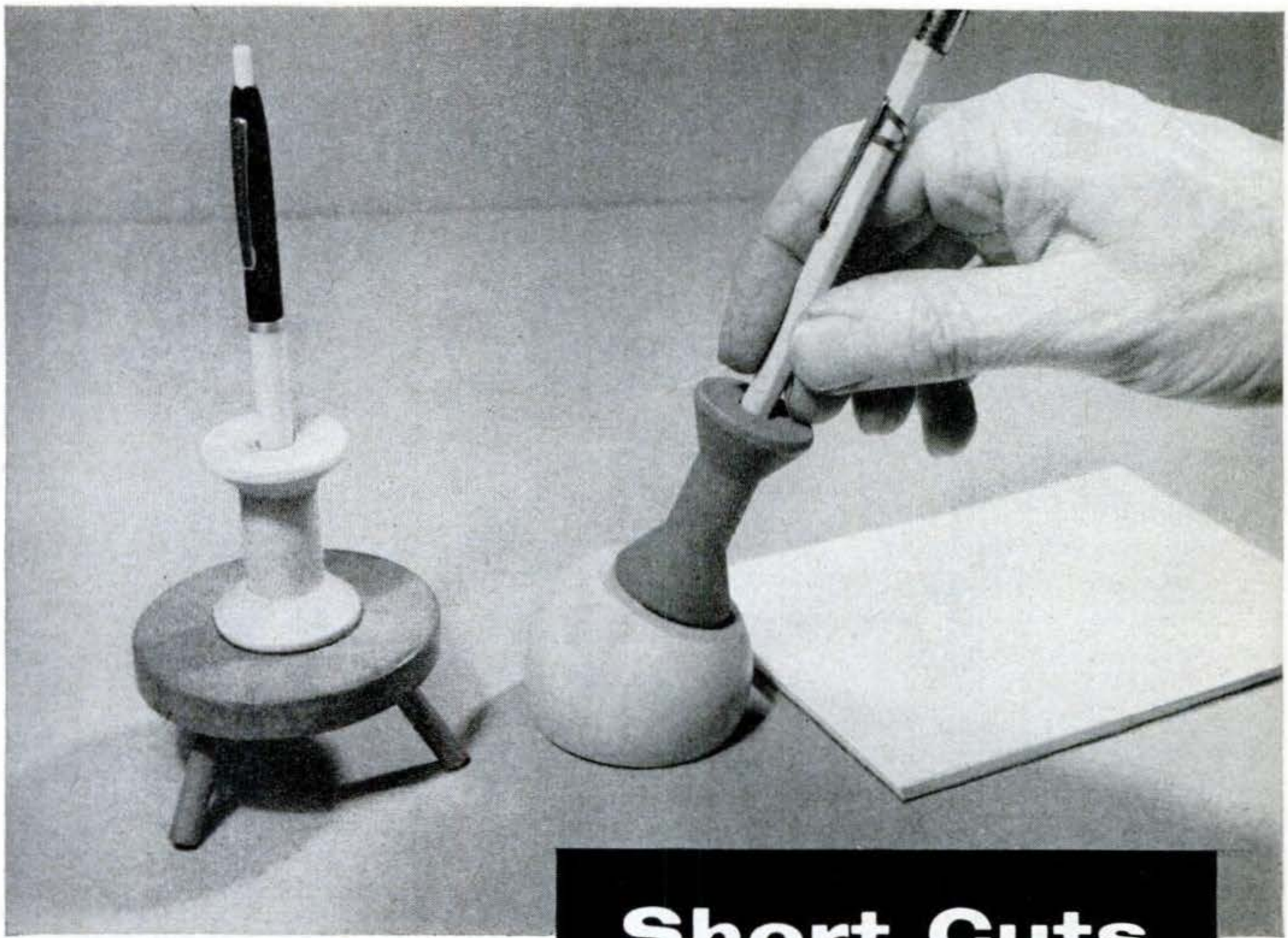


Short Cuts and Tips

FROM PS READERS

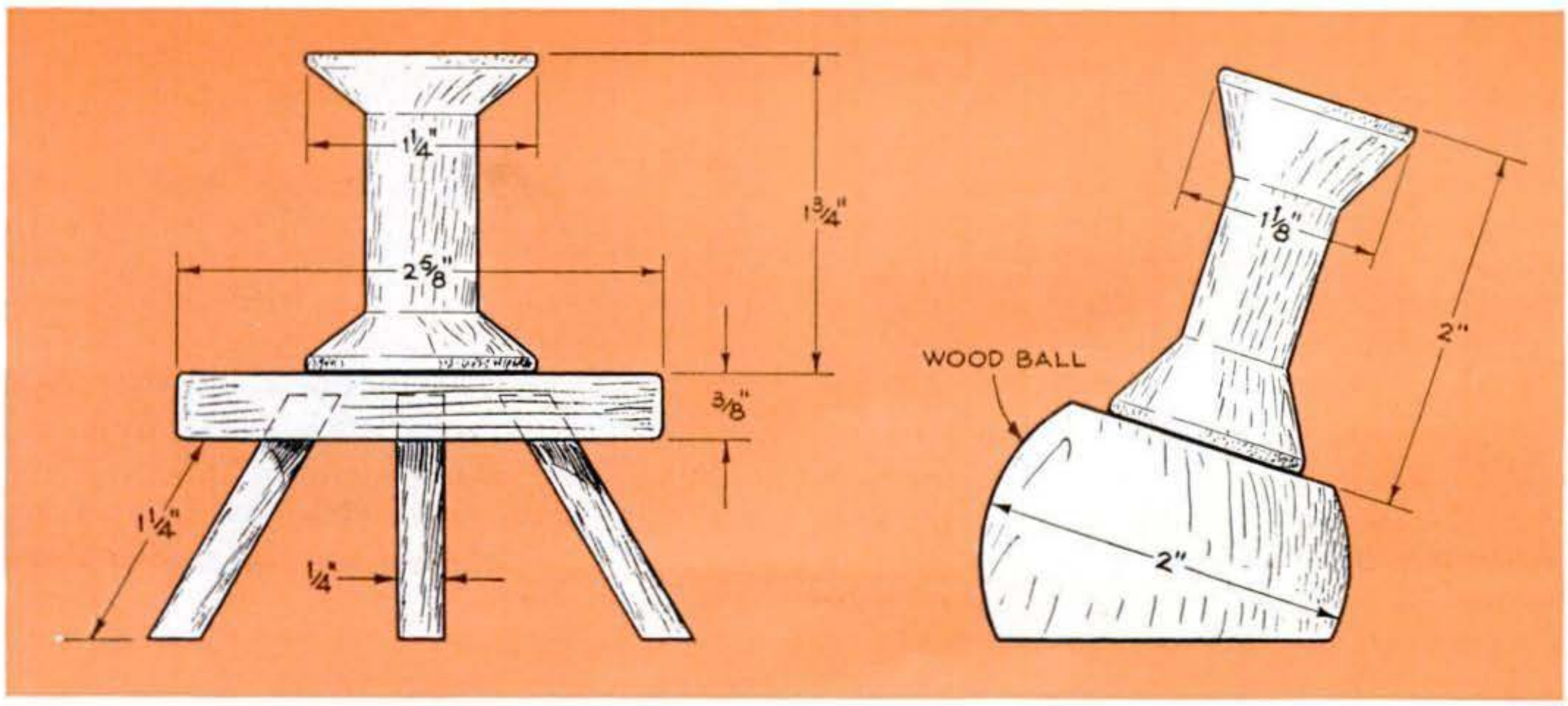
Novelty Pencil Holders Made from Spools

You can make handy little holders for ball-point pens and pencils by mounting empty spools on attractive bases.

The Colonial number at left is a spool glued to a disk fitted with dowel legs; at right is a spool glued to one of two flat surfaces sliced on a wooden ball.

You may have to ream the spool holes slightly for a good fit. Points can be protected by leather or cork disks glued at the base of the holes.

Then finish in natural wood or lacquer in colors for gifts that will be appreciated.—*Walter E. Burton, Akron, Ohio.*



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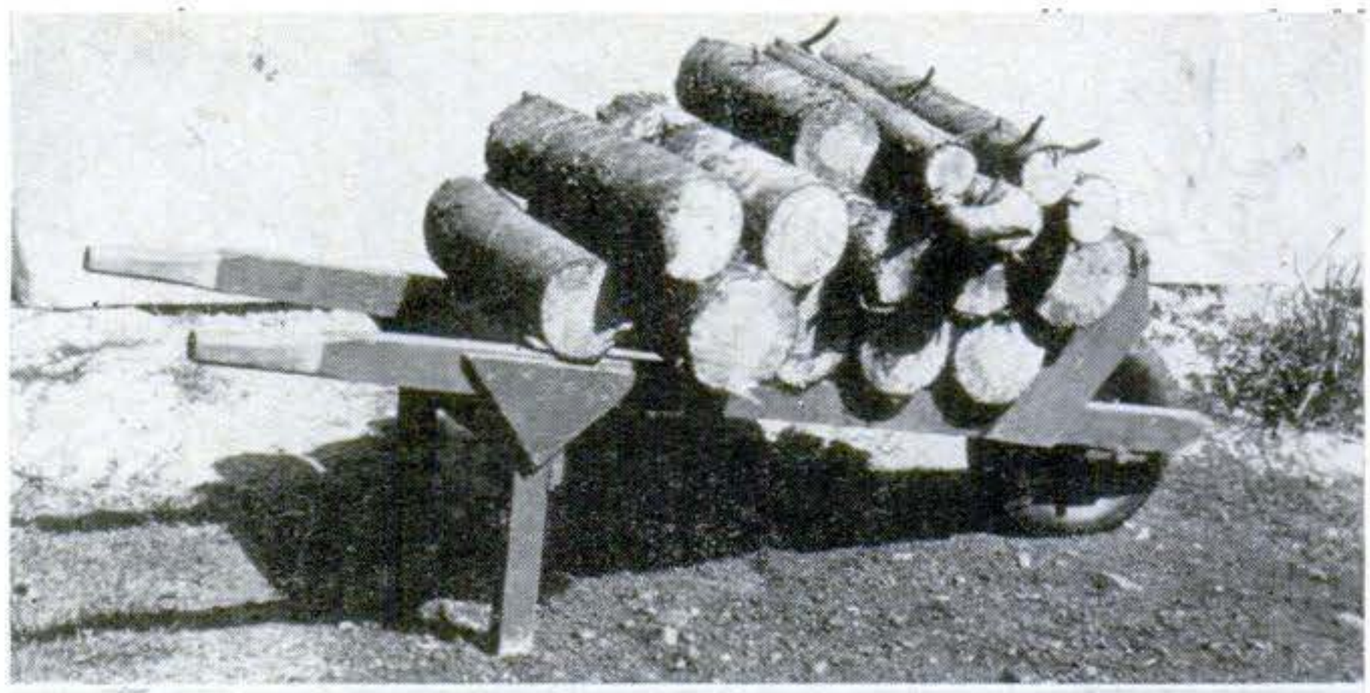
Short Cuts and Tips

Hauling Firewood? Use a Logbarrow



HAVING expended a great deal of energy and patience for many years trying to haul fireplace logs in a garden wheelbarrow, this year I cut time and labor in half by making my own logbarrow for a man-size job.

I bought a standard rubber-tired barrow wheel assembled on an axle and mounted it in a homemade flat-bed frame with a bumper to keep logs from rolling off at the front. For the frame and legs I used two-by-fours, shaping the ends of the frame for handles and nailing them to cross braces and gussets. —*R. P. Dunlop, Cowichan Station, Can.*

Coiling Hose Without Kinks

WHEN you coil a garden hose for storage in the fall, twist every other loop so that the uncoiled end is first on the outside and then on the inside. This alternation of loops will keep the hose from kinking when you pull it out straight by one end.—*Thomas Lyons, NYC.*

▶▶▶WHEN our car conked out on a camping trip, with no help for miles, I shorted out individual cells of the battery with pliers, until I found the one that was dead. Then I held the pliers tight across that cell while my wife pressed the starter button. The car started easily, as there was enough reserve of current in the other cells to get the engine turning over.—*David L. McCall, Palmetto, Fla.*

Mercury Adds Two Outboards

A TWIN-CYLINDER 15-hp. and a four-cylinder 35-hp. engine enlarge the Mercury outboard line to nine. Just brought out by Kiekhaefer, Fond du Lac, Wis., the Mark 15A is designed for the "fishing" class. The Mark 35A (above) fills out the medium-horsepower range.

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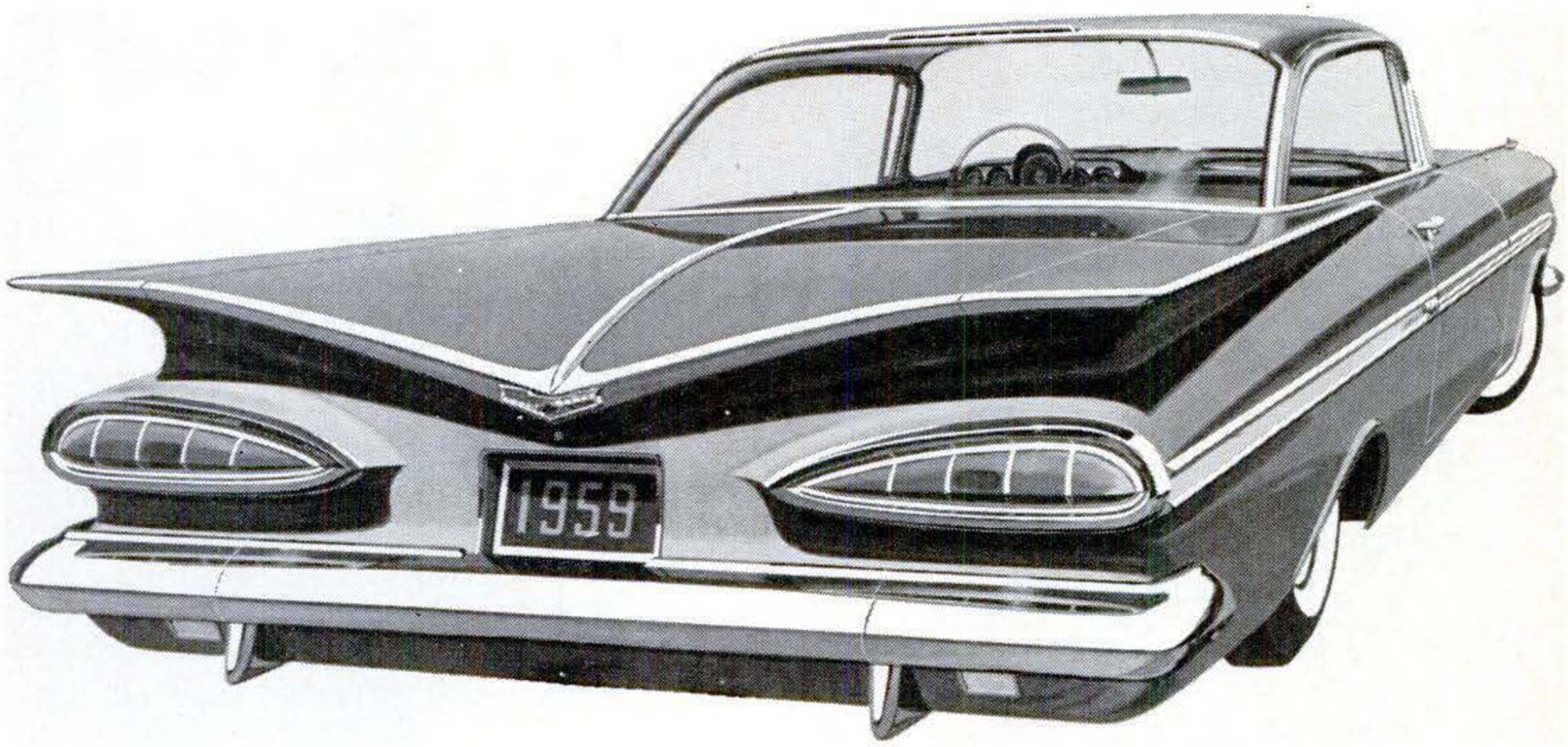
The Bel Air 4-Door Sedan with Body by Fisher

NOTHING'S NEW LIKE CHEVY'S NEW!



. . . and just look at the Impala Sport Coupe.

One look tells you '59 Chevrolet has a whole new slant on driving, from the overhead curve of its windshield to the sheen of its Magic-Mirror finish—a new acrylic lacquer that does away with waxing and polishing for up to three years.

But to discover all that's fresh and fine you must relax in Chevy's wider seats, feel the loungelike comfort of its new interior, experience the hushed tranquillity of its smoother-than-ever ride.

Once on the road you'll also find such basic benefits as bigger, better cooled brakes, a quieter, solidly built Body by Fisher, new easy ratio steering.

Your Chevrolet dealer's waiting now to show you the car that's shaped to the new American taste. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

What America wants, America gets in a Chevy!

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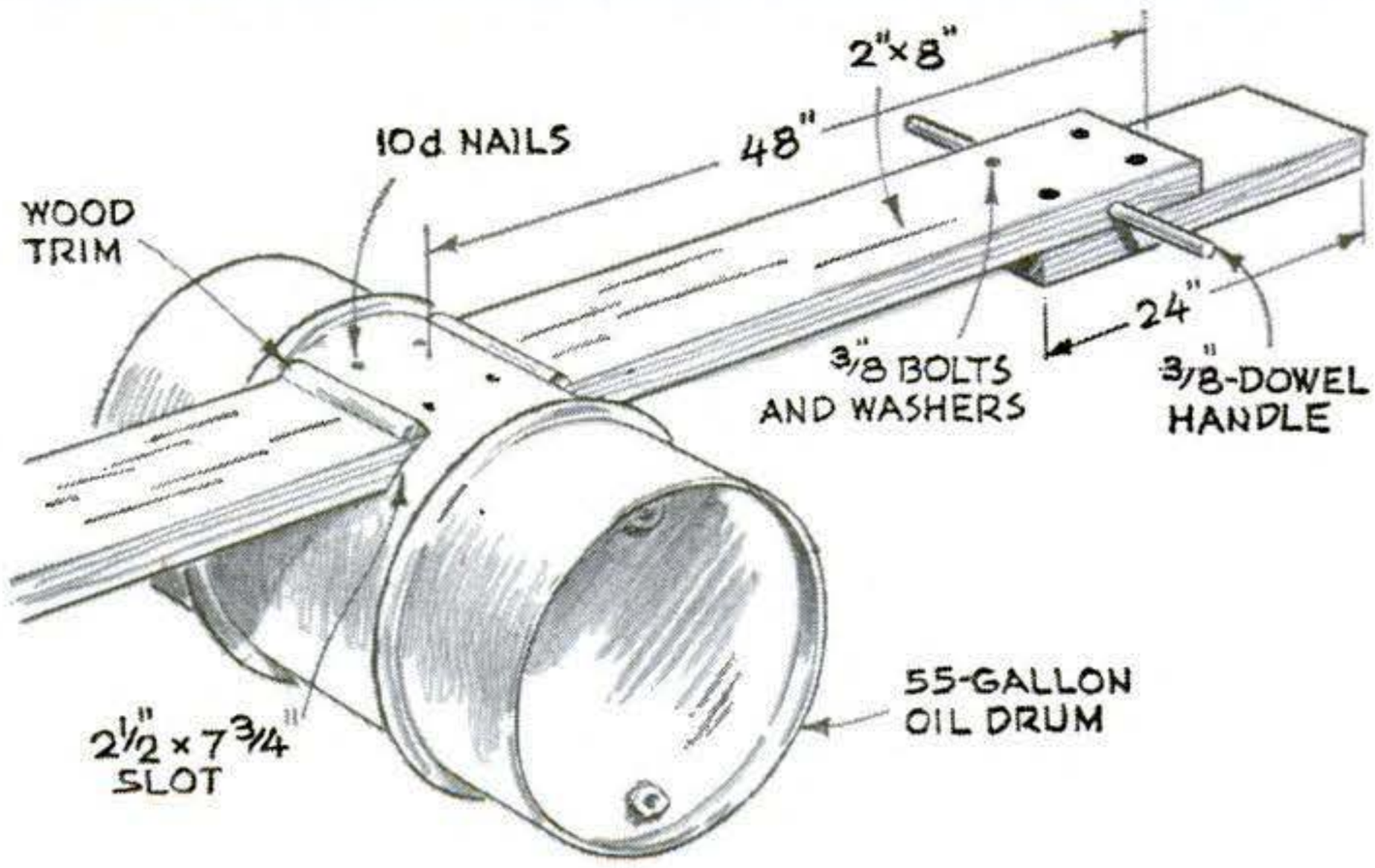
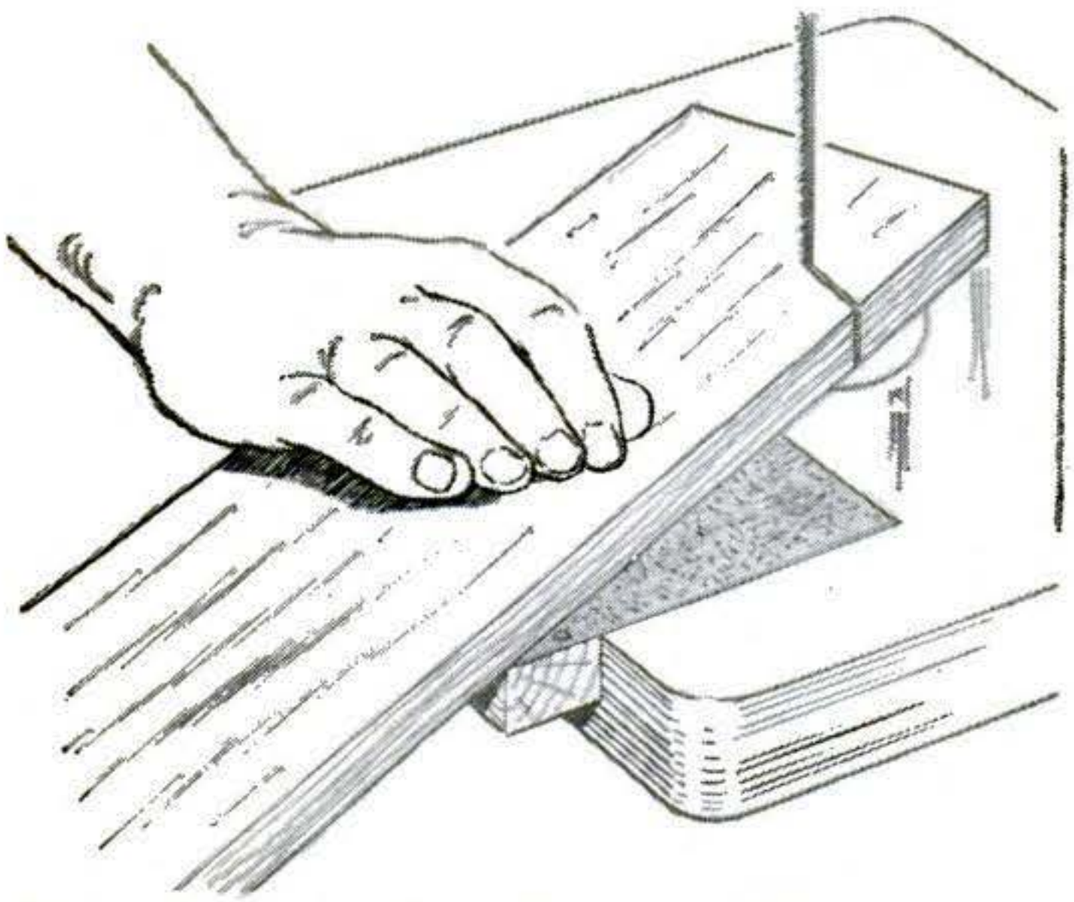
Short Cuts and Tips

Discarded Oil Drum Makes Fine Seesaw

AFTER planning most of the summer to make a teeter-totter for my kids, I hit on this obvious solution: using an empty 55-gal. oil drum for a fulcrum.

With a hammer and cold chisel, I first cut two slots in one side—a drill and saw bit might have done it faster. Then I forced a plank through them, held it in place with nails, and covered the rough edges with wood trim. Seats bolted on the ends and dowels in drilled holes to form handles completed the job. The kids love it.—*Floyd R. Keith, Rochester, Mich.*





Sandpaper for Jigsaw Fence

A PIECE of coarse sandpaper tacked at one end to a wood block forms a good fence for holding work at an angle on the jigsaw. Place the block against the side of the table, with sandpaper extending onto the table top, position the work and push the whole assembly through the saw. The table serves as a guide, and the sandpaper keeps the work from slipping.—*M. Robert Beasley, Jackson, Mich.*

Cotton Swabs in the Shop

ONE good use for cotton swabs filched from the medicine cabinet is as a handy brush for painting small articles or retouching chipped enamel. The cotton-on-a-stick also can be used as a lettering brush.—*Shiela McKeon, NYC.*

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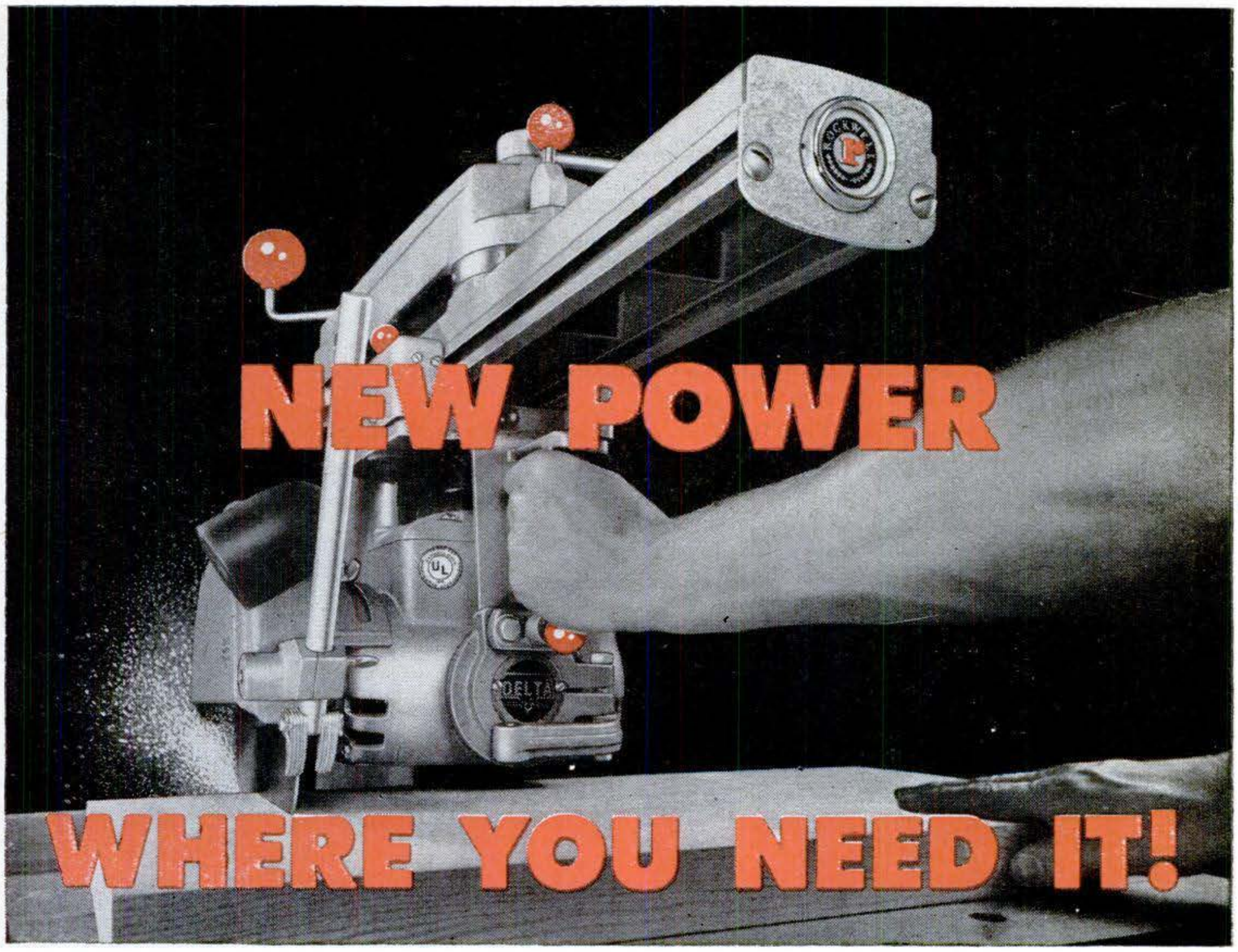
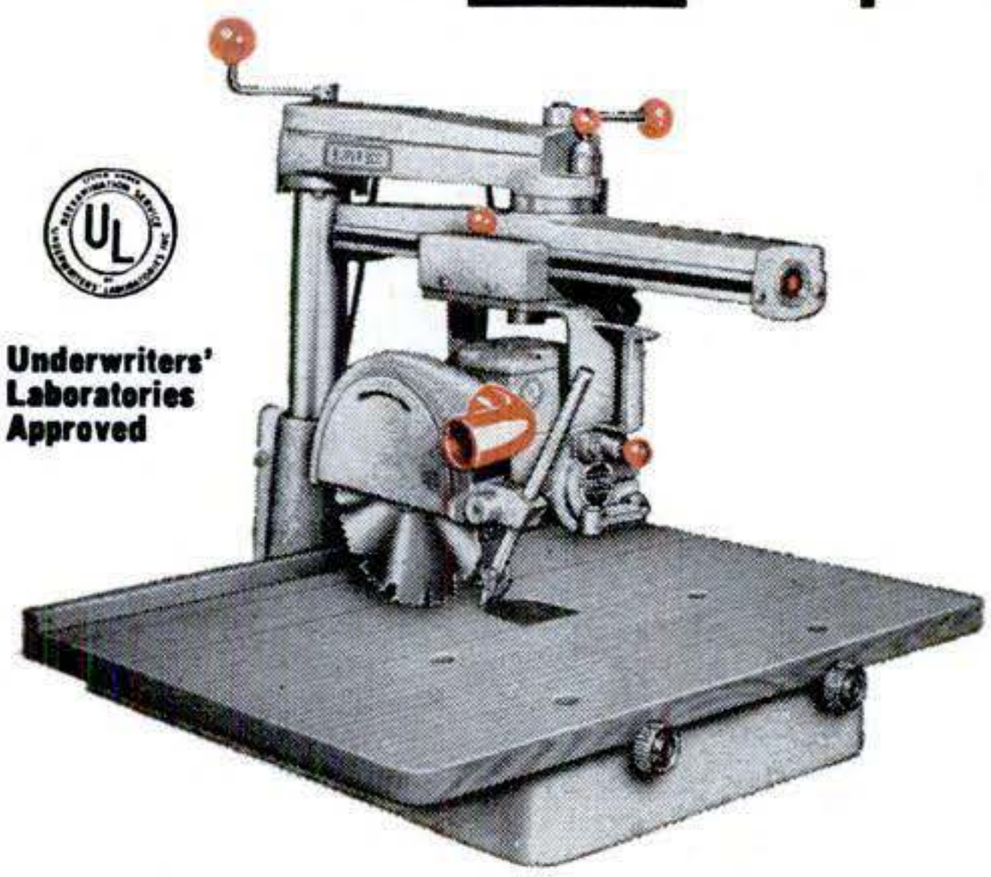


NEW DELTA "SUPER 900" RADIAL SAW

with honest 1 h. p. motor that develops up to 2 full h. p.!



Underwriters' Laboratories Approved

NEW DELTA "SUPER 900": *Honest* 1 h.p. motor guaranteed for a full year! New "up front" guide fence positioning knobs and easy access controls. Plus exclusive combination of Delta Quality features: double overarm construction, and select edge grain fir table.

It's the guts—not the gimmicks—that count in a radial saw. Delta's new "Super 900" has *honest* power where you need it—*at the blade*—for greater sustained cutting, faster, smoother working, and safer operation. *More power than any 9" home workshop radial saw ever built!* The "Super 900" is actually a complete, all-purpose workshop. With Delta's *exclusive* "turret arm" action you can swing, spin and tilt the head; any job is easy, even left hand mitering.

See this incomparable new "Super 900" today at your Delta dealer—he's listed under "TOOLS" in the Yellow Pages—or at leading department, hardware or building supply stores. Arrange easy terms to suit *you*. Rockwell Manufacturing Co., Delta Power Tool Division, 504L N. Lexington Ave., Pittsburgh 8, Pa.

DELTA POWER TOOLS

another fine product by

ROCKWELL

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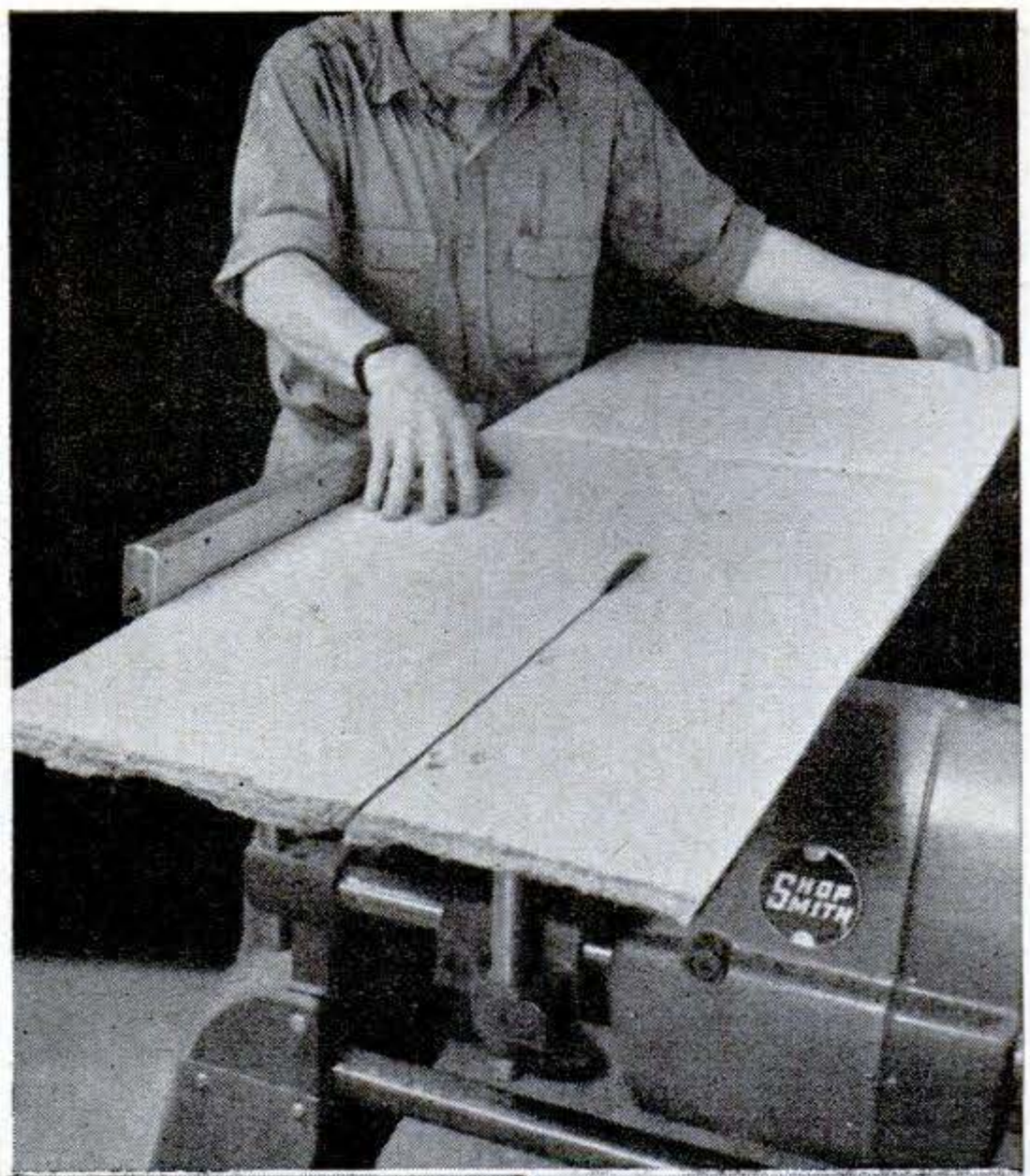
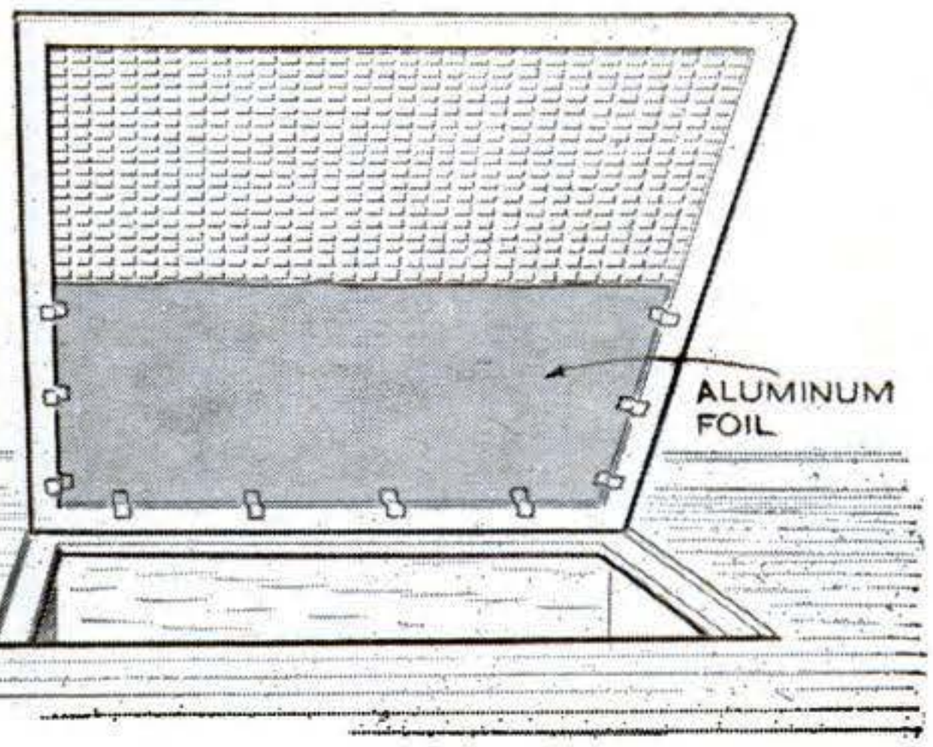
Short Cuts and Tips

Used Wallboard Is Cheap Tiling

By scouting around for secondhand wallboard, I got plenty of ceiling tiles for my cabin at a cent per square foot. I cut the board into 12″-by-12″ squares and beveled all edges on the face side of each.

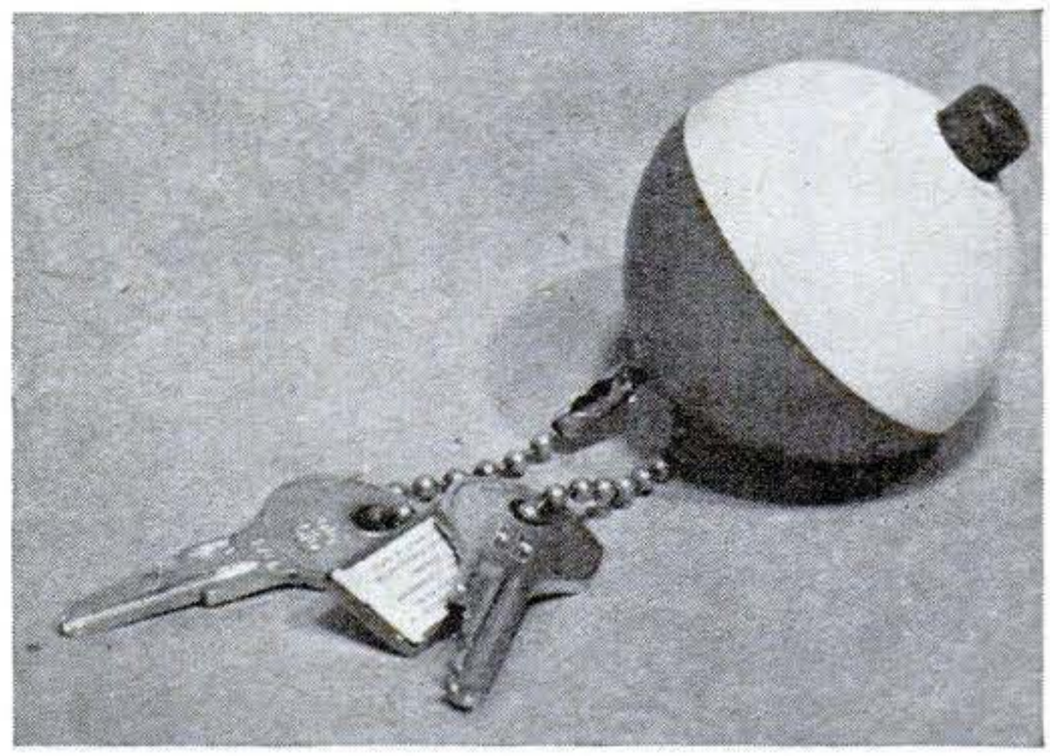
Before sticking the squares up with mastic, I gave each two coats of rubber-base paint. This got me out of arm-cramping, neck-twisting work painting tiles after they're up.—*Paul Corey, Sonoma, Calif.*





Foil Keeps Idle Furnace Clean

To keep dirt from accumulating in my floor furnace during the summer, I cover the underside of the grille with aluminum foil. Cellophane tape holds it in place. —*Hugh Lineback, Stillwater, Okla.*



Keys Float in Safety on Bobber

A snap-on fishing bobber can be a life preserver for keys. Snap it to the key chain before you start on a fishing trip, but try it in the tub first to be sure it is big enough to float the load.

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from SKIL

NEW PERMA-GRIT* SAND 'N PLANE KIT

works wonders in your home

Completely new Hand-Sander and Sander-Plane really speed through do-it-yourself projects. Each tool has a working surface of Tungsten Carbide particles permanently bonded to steel. Stays sharp for years and years. Ideal for smooth finishing of wood, plastic, wallboard, compositions or leather. Makes removal of paint or varnish easy.

On the "Perma-Grit" Hand Sander, one Tungsten Carbide sheet outlasts hundreds of paper sheets. Sands twice as fast...always ready to use when you need it. Comes in kit with fine grit sheet, but other types also available.

For sanding doors, windows, cabinets, try the "Perma-Grit" Sander-Plane with its convenient handle and front grip. Extremely handy in every workshop—files, sands, planes, shapes or notches. Removes material in half the time as it works forwards and backwards. Reversible blade for fine and coarse work.

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NEW! "Perma-Grit" Files

Cut working time in half. Remove material on both forward and backward stroke or in circles. For shaping, filing and notching on flat or curved surfaces of wood, compositions, plastics.

Flat File (Medium 80 grit one side; coarse 46 grit other side) **$2.25**

Contour Files (Coarse or Fine) . . . **$1.95**

"Perma-Grit" 5-in-1 Wheel
For table and radial saws

Saws, sands, shapes, ploughs, dadoes with complete safety. Unlike tooth-type blades, it can't snag or pull—eliminates "kickback." Wide selection of grit types on edge and sides.

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"Perma-Grit" Blades also available for portable saws.

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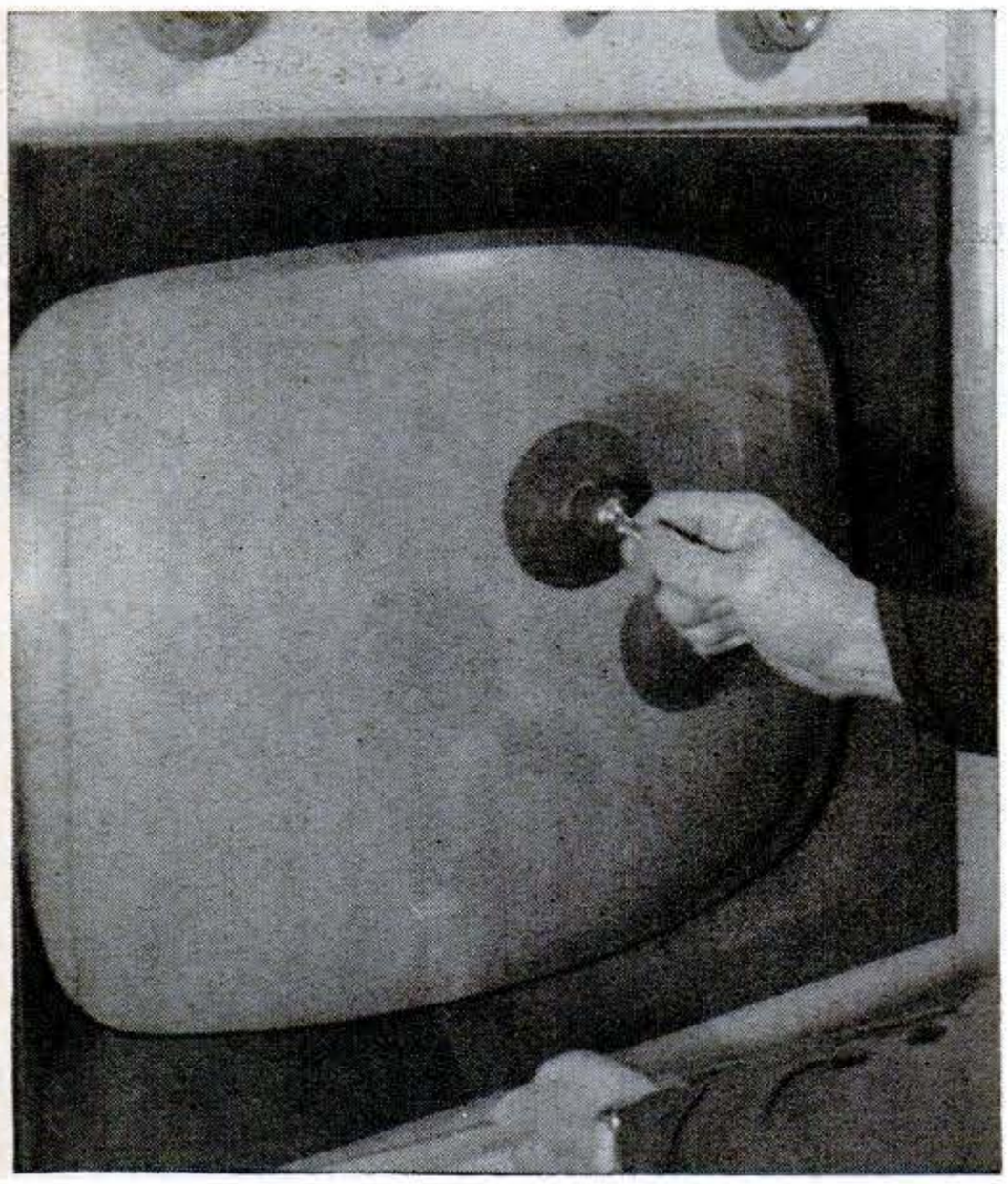
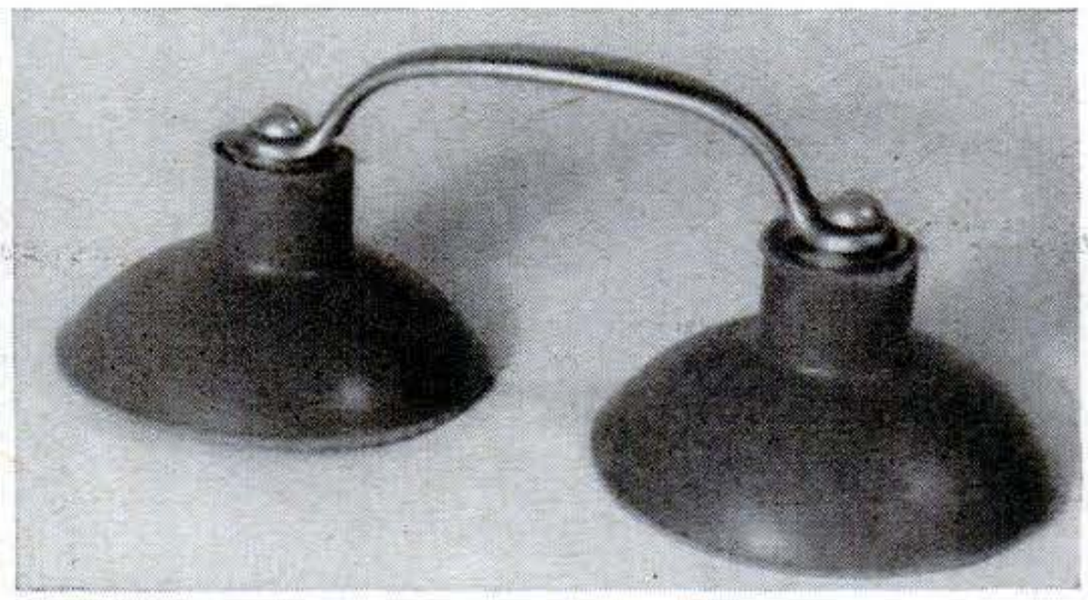
Short Cuts and Tips

Kerosene-Soaked Brick Kindles Fire

A COMMON brick is a handy piece of camping equipment. Before leaving on a trip, soak it for a day or so in kerosene, then drain and wrap it in several layers of newspaper.

When building a fire, place fuel over and around the brick. Ignited with a match, it will start a good fire in any weather. Take several on a long trip.—*W. S. Low, Chicago.*

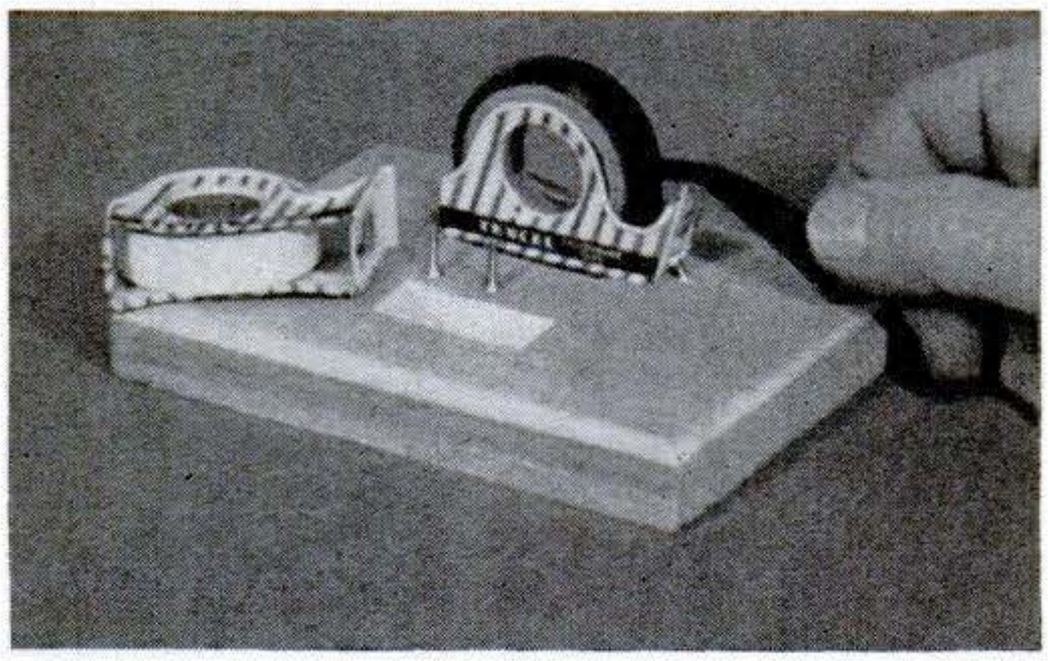




Suction Tool Grips TV Glass

A SUCTION lifter will remove the glass safely from a TV set so you can clean the picture tube behind it. You can make it from two car-rack suction cups, a couple of washers and a screen-door handle.

Press the cups against the glass separately for a firm grip, as at left. Then shift the glass to right or left, upward and out. On some sets you may have to remove the upper molding strip first.



Block Anchors Tape Dispenser

FASTEN a cellulose-tape dispenser to a block, and you can tear off tape with one hand. Just drop a screw through a hole punched in each metal end and drive the screws into the wood at an angle.

The same setup will take big rolls of shop tape if you chisel a well for clearance. Use an empty tape spool as a core if the center hole of the roll is too big. —*W. K. Clayton, Pasadena, Calif.*

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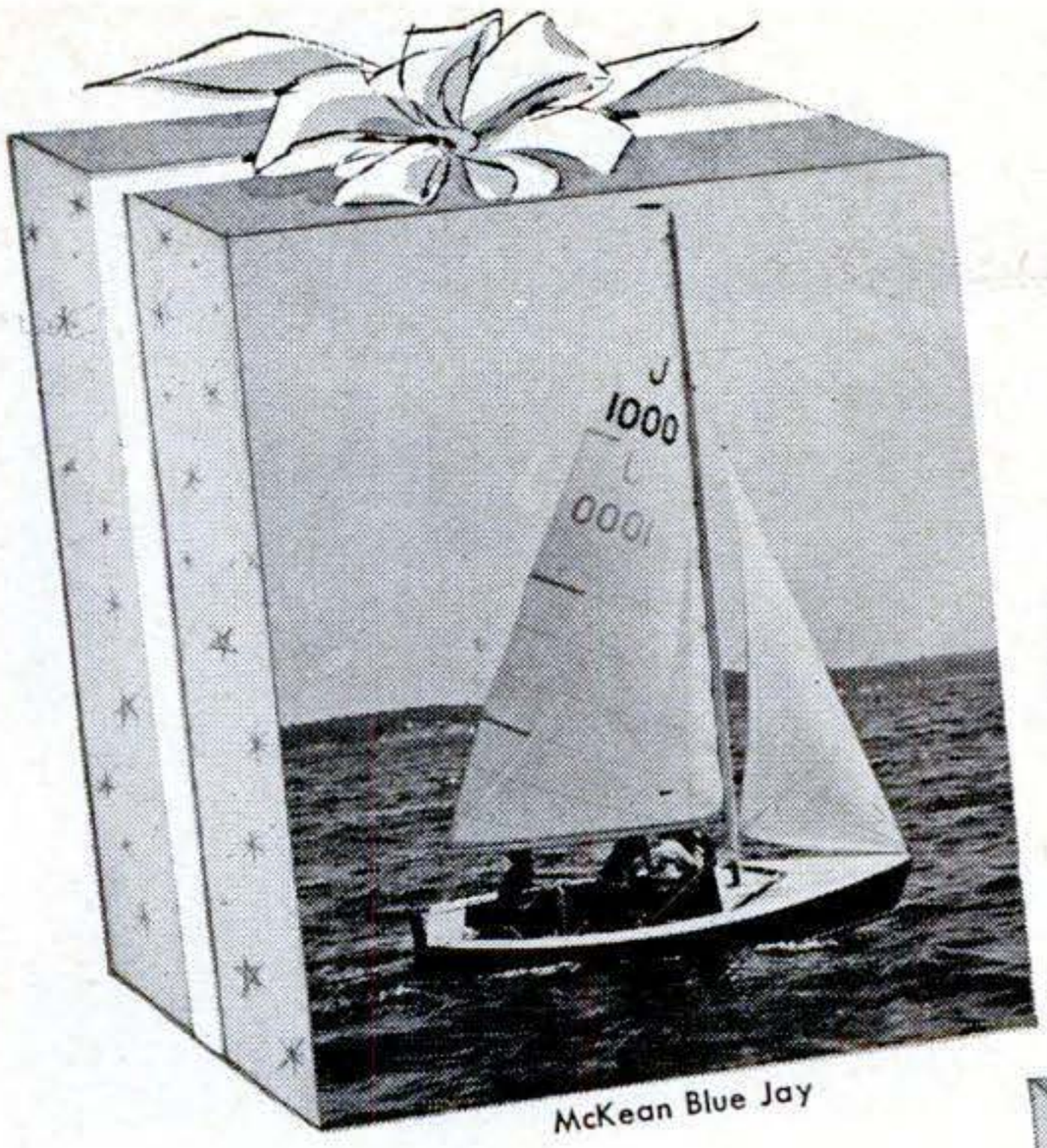
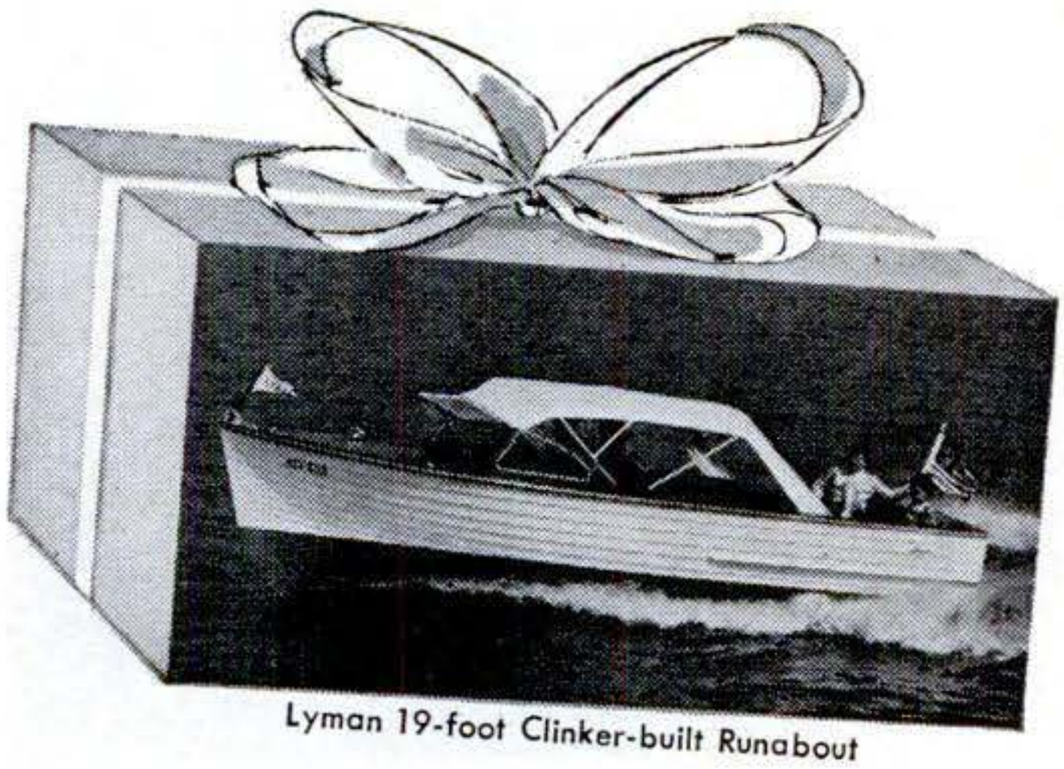


McKean Blue Jay

Wagemaker Wolverine 17-foot Catalina



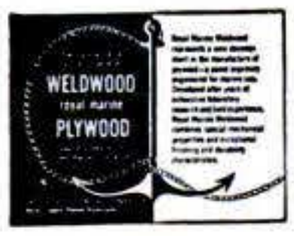
Lyman 19-foot Clinker-built Runabout

Chris-Craft Boat Kit

Make this a family boating Christmas

GIVE A BOAT OR BOAT KIT

Now's the time to get the jump on next summer's family boating fun and solve all your family Christmas gift problems at once. Whichever boat you choose, you'll want one that will give you years of dependable service and economical operation. You can be sure of both in a boat made of Weldwood Royal Marine Plywood. Expressly engineered to exceed the requirements of today's high-speed boats, Weldwood Royal Marine Plywood assures you of top boating enjoyment because it resists impact, withstands rot and fungus, cuts maintenance problems, finishes beautifully, and is guaranteed never to delaminate.



For top family boating fun, visit your boat dealer's before Christmas and select a boat or kit that displays the Weldwood Royal Marine Plywood label.

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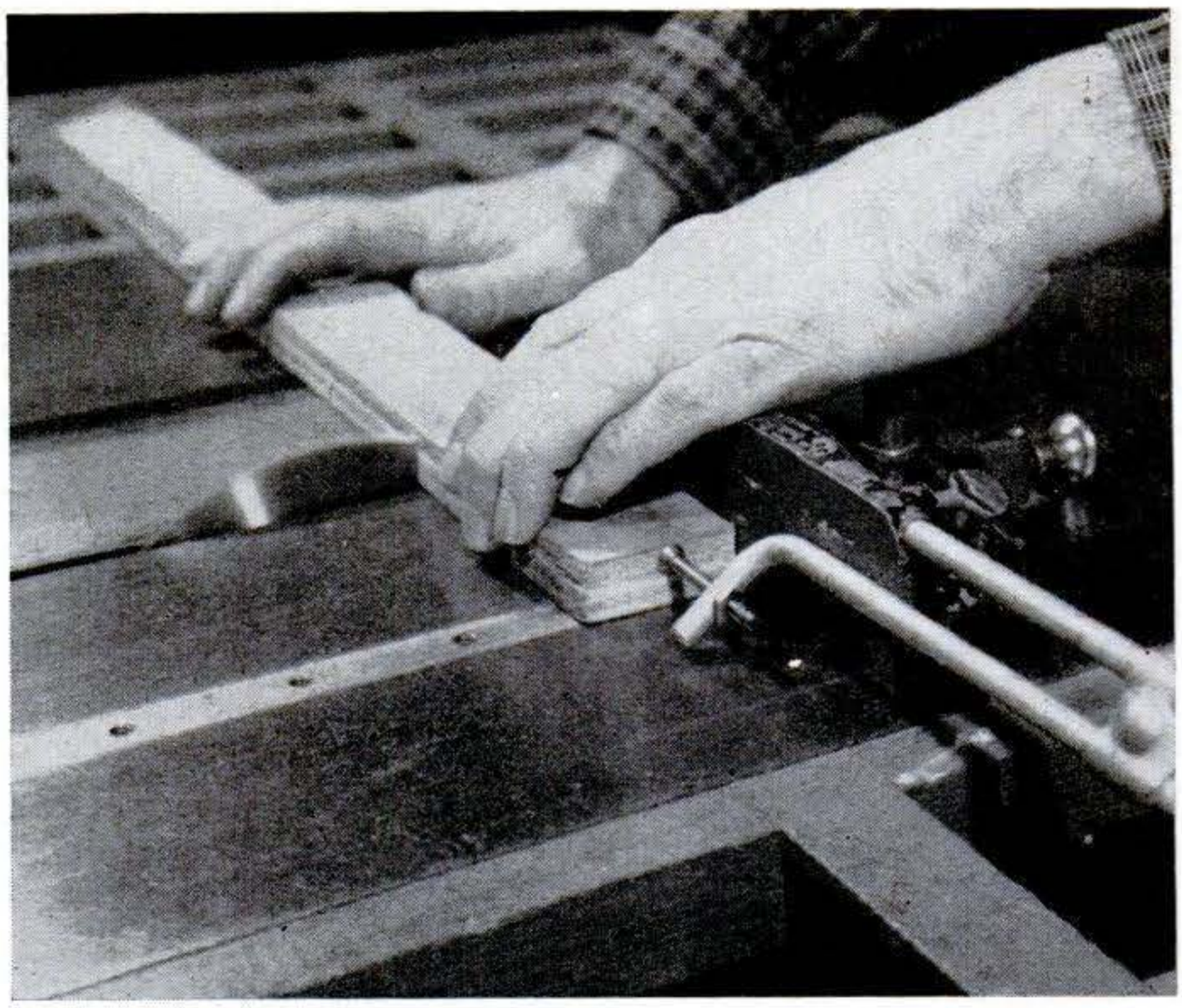
Short Cuts and Tips

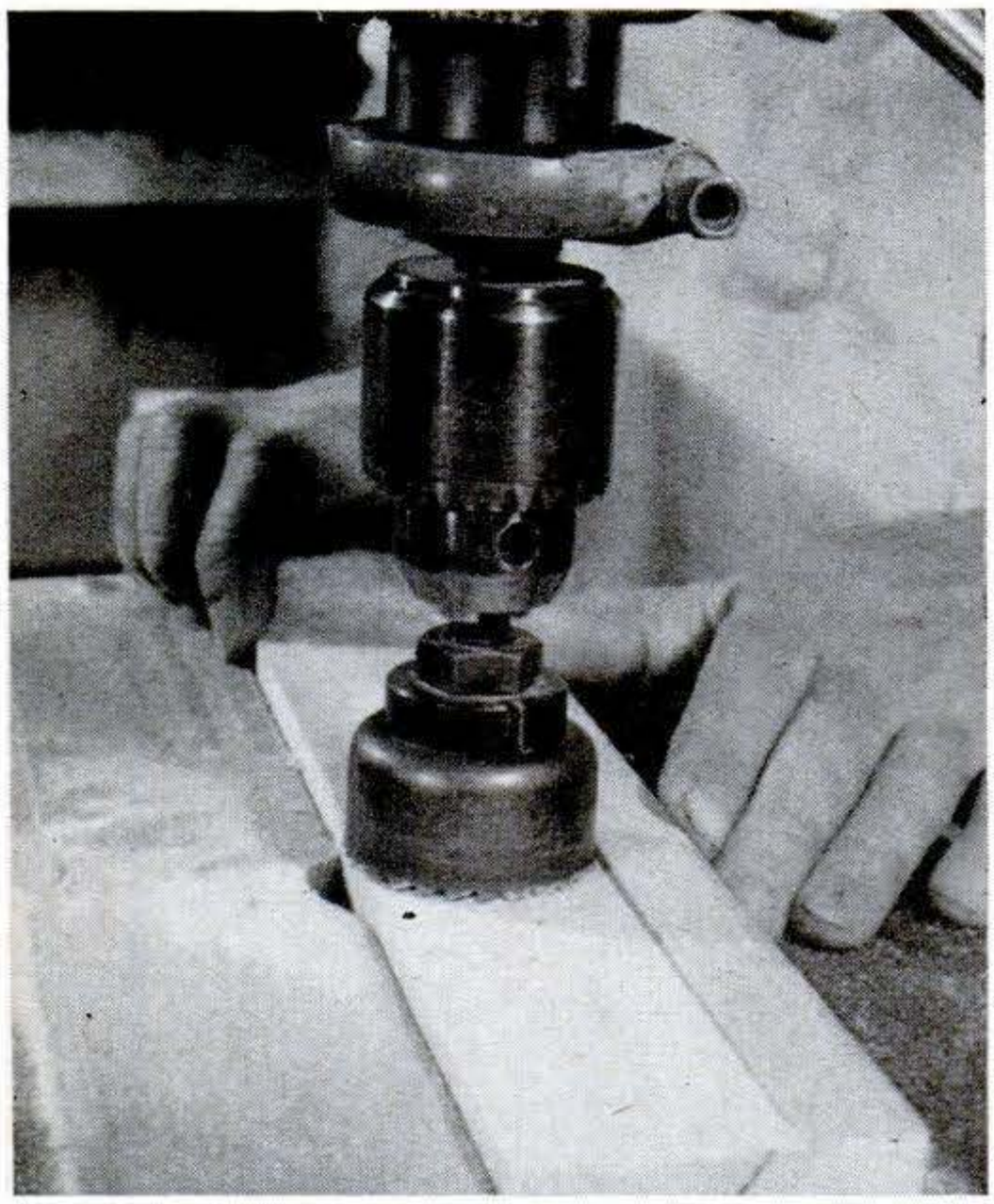
Stop-Rod Vernier Made of Bolt and Nut

A GOOD vernier adjustment for a miter-gauge stop rod can be made from a flathead bolt and a nut, as at right (saw guard raised for photo). Drill and tap the "L" parallel to the long end, and lock the bolt in place with a nut.—*Carleton A. Phillips, Corning, N.Y.*



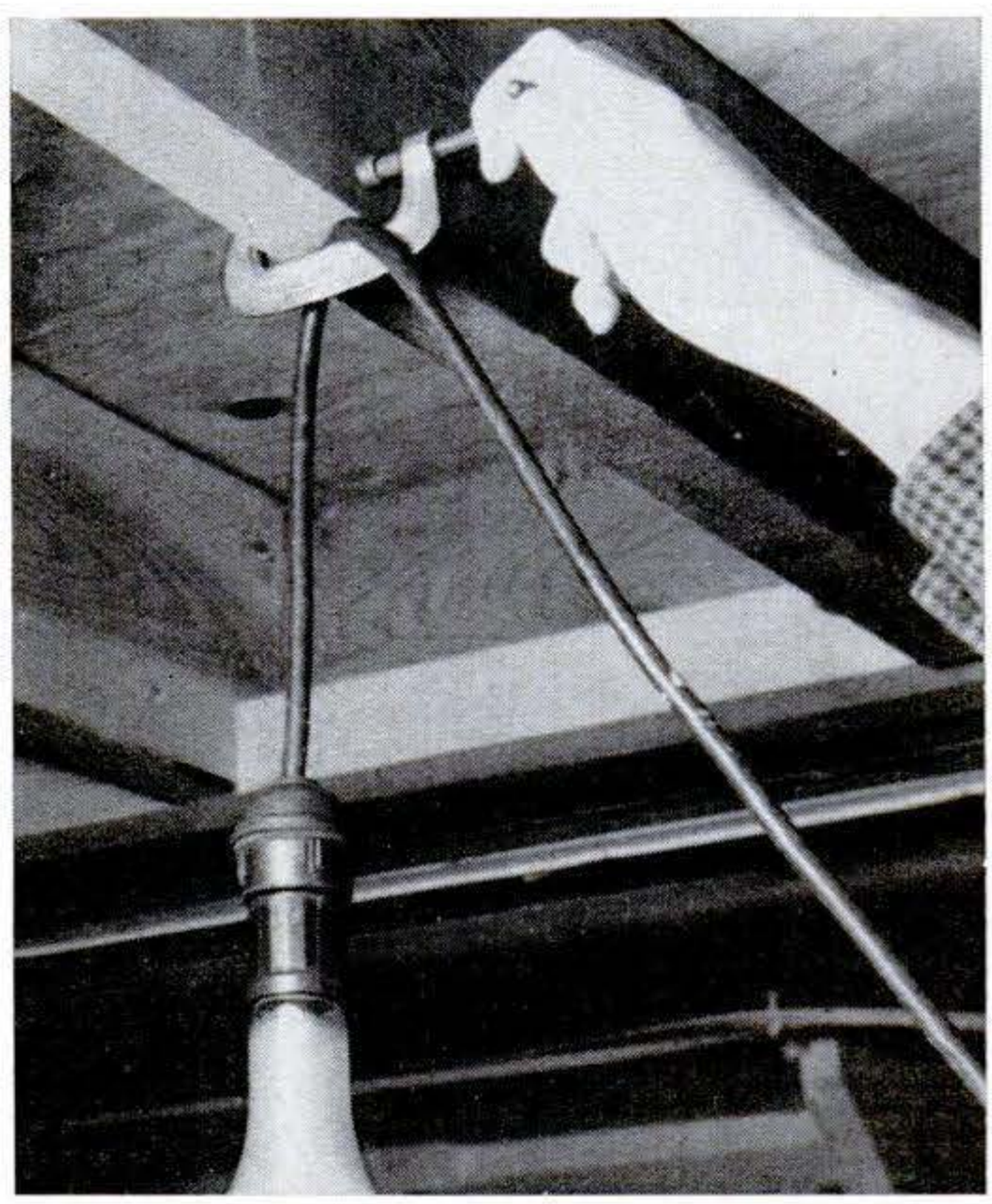
▶▶▶YOU can keep marshmallows and hot dogs from sliding off a toasting fork by bending ripples in the tines. Use pliers or dent with a hammer on the edge of a block. —*Wellington Fung, San Francisco, Cal.*

▶▶▶TO PLANE oak or other hardwoods, I wet the wood. The work goes fast and it is easier to clean the plane. Take the last cuts dry to avoid discoloration.—*Nils E. Mockler, Putnam Valley, N.Y.*



Hole Saw Used for Planer

IF YOUR shop isn't equipped with a rotary planer, you can use a hole saw mounted in the drill press. Watch the depth of cut; it must be less than tooth height for each pass of the board.—*Charles A. Pendleton, Rochester, N.Y.*



Extension-Light Holder

AN EASY way to hold an extension lamp in place is to clamp it to a joist. Adjust the cord to the height you want and tighten a C clamp against it. The cord then can't slip and endanger the bulb.—*Ralph J. Ahrens, Neshanic Station, N.J.*

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Choose either big saving!

Hurry, offer good for limited time only!

WE PAY YOUR DOWN PAYMENT

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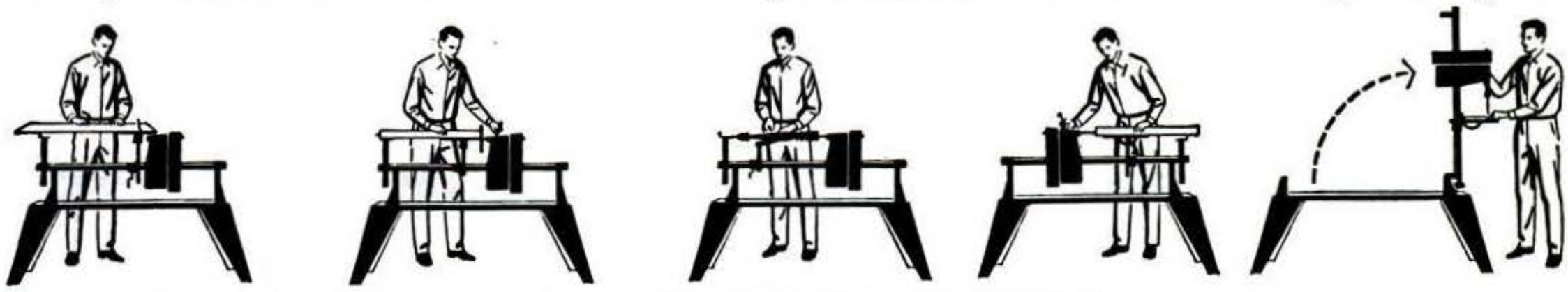

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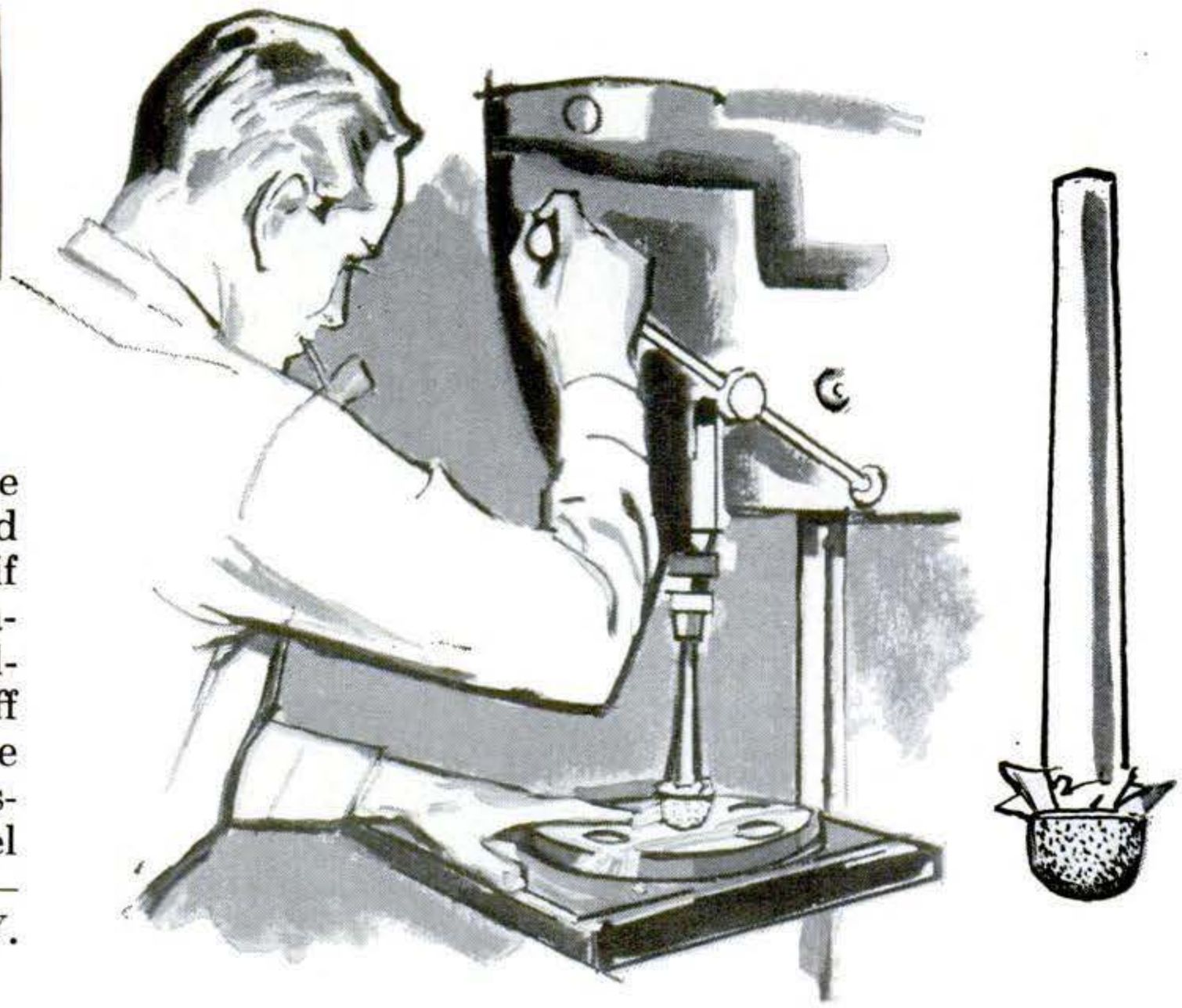
Short Cuts and Tips

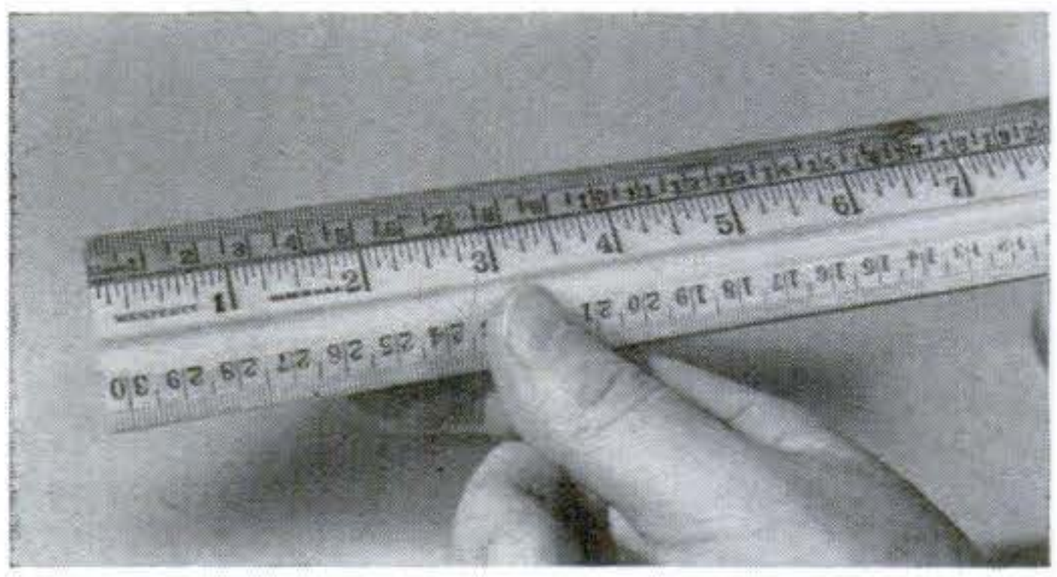


Dowel Substitutes for a Routing Bit

A ¾″ DOWEL with coarse sandpaper wired to one end will cut shallow recesses if you have no routing bit. Taper the dowel to fit the drill-press chuck and round off the opposite end to receive the sandpaper. Apply pressure on the spinning dowel to form smooth recesses.—*Lester Victor, Syracuse, N. Y.*

Baking Pans Give Neat Shop

IF YOU stack boxes of shop parts or scatter them around the shop on shelves, under the bench and on rafters, it may be easier to buy a part than to find one. I organized my stock by building compartmented cabinets and fitting them with metal trays. Baking pans 1½″ by 7″ by 11″ serve for trays and each carries an identifying label. —*J. C. Magee, Schenectady.*



Gluing Rulers Aligns Scales

A RULER giving inches along one edge and centimeters on the other usually runs the scales in opposite directions. But I wanted measurements in either scale at a glance. Gluing two such rulers together did it—I reversed and overlapped them to line up metric readings right alongside linear ones.—*Kent Munson, Detroit.*

Projector Enlarges Stamps, Too

IF YOU are a stamp collector with a slide projector, you can blow up stamps on a screen to identify issues or to illustrate a talk. Mount the stamps in come-apart metal slide covers or insert them between glass in cardboard covers sealed at the edges with strips of tape.—*Bronson Bedworth, New Haven, Conn.*

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DREMEL MOTO-SHOP

A complete workshop—
for the family, hobbyist, or craftsman

The amazing new Dremel Moto-Shop is the most versatile multi-purpose tool ever invented. Has 1,001 home and shop uses. Basically, it's a 15″ Jig Saw with a unique power take-off to which you simply connect other attachments. It then converts to a disc sander, bench grinder, buffing wheel, and a flexible-shaft machine . . . all powered by a BALL-BEARING ROTARY MOTOR.

And this professional-quality, portable power shop can be set up practically anywhere — basement workshop, kitchen counter or card table. Weighs only 12 lbs. As a Jig Saw, it will cut 1¾″ wood, 18 gauge copper, 1/16″ steel — all with same blade. Foolproof blade guard makes it absolutely safe — even for children. Handles everything from bird-houses to full-size furniture.

The flexible shaft is a complete machine shop in itself. Use it for sharpening, grinding, polishing, drilling, carving. Collet capacity 1/64″ to ⅛″. Other attachments have hundreds of home and shop uses.

Moto-Shop is the perfect "ALL FAMILY" workshop — safe for even mom and the children. Helps build a close father-son relationship.

See Your Power Tool Dealer for a Demonstration Today!

Model 57 Moto-Shop. Includes Jig Saw with disc sander attachment only. Other attachments can be added later - - - **$33.95**
Deluxe Model 57 Moto-Shop with all attachments shown - **$49.95**
Price of attachments only, if purchased separately - - - **$19.95**

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ONE BIT FOR ALL .... DRILL SAW • REAM CUT

Handiest drill bit made. Use on any electric drill, lathe, drill press, etc. Made of finest American hi-speed steel. 3½″ long, ¼″ diameter. Has 2″ side-cutting section. Cuts steel, wood, plastic, aluminum, etc. 3 types —specify types wanted. (1) All purpose, (2) Wood, (3) Heavy metal. *$2.45 each — 3 for $7.00 — Postpaid.* Money back guaranteed. Buy from your dealer or send check or Money Order and name of favorite tool dealer TODAY. (Makes ideal gift.)

BEAVER HI-SPEED-SAW DRILL BITS

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IDEAL for home-workshops; carpenters, contractors, QUICK-WAY unit precision sharpens, joints, gums and retooths all circular saws to 12″ diameter. Fits all bench, table and radial saws. Thousands of —satisfied users. *Send for Circular* Make money sharpening saws. Order today $19.95 postage-paid. Complete Unit with Grinder Wheel. No Extras to Buy. Patented.

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You can start in a solid, depression-proof business in three or four weeks. You will call on service station operators who count on you to supply them with products they must have to run their business.

We know what kind of man will make a business like this go. And we will show him exactly how to get started. What's more, if we pick you, you will be thoroughly trained until you are well on your way to a substantial income from a "protected" territory of your own.

If this is what you are looking for, mail the coupon below. We'll send you a free copy of our booklet, "So You Want To Be Your Own Boss!" by return mail. Naturally, you won't be obligated in any way.

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the famous "500" line BOWES SEAL FAST INDIANAPOLIS of car care products

Taking the Trickery Out of Tire Ads

[*Continued from page 101*]

FTC, an ad must not say a tire is guaranteed without also saying for what, how long, by whom, and on what price basis.

This last, the crux of most abuses, is directly related to the tradition of phony pricing. Say you bought a tire for $18 with a good, one-year, unconditional road-hazard guarantee. It blows after six months, and you take it back expecting a 50-percent or $9 allowance to make up for the half year of service you didn't get. The dealer is a man of his word. He's happy to allow you the 50 percent, but the tire, you see, has a "regular" price of $32. You can therefore get a new tire for $16 plus tax, plus $3 since a blown tire isn't acceptable for recapping, plus a charge for mounting since he's losing money on the deal.

The basic cure for this absurd—but very common—trap by which you may pay more for a guarantee adjustment than for a new tire will hinge on list-price reforms. Improvement in this direction may be a while in coming. Meanwhile, say the Guides, an advertised guarantee must disclose the price scale on which it is based if this is different from the actual selling price.

Other claims

The new Tire Guides are thorough. In addition to a catch-all clause against any statement, implication, or omission that might deceive a purchaser, it specifically requires clear and truthful descriptions of used tires, "change-overs," "new car take-offs," discontinued models, and blemished, imperfect, or defective products. Lines that were once—but are no longer—original equipment cannot be advertised as O.E. without disclosure of the last year they were used. Safety claims must also be qualified; unless tires afford "complete and absolute protection from skidding, blowouts, or punctures, as the case may be, under any and all conditions," ads must not imply that they do.

Can the Guides be enforced? The wide-ranging, free-swinging document that is expected to raise some legal storms is not a new law, but rather a glorified inter-office memo. The Federal Trade Commission Act of 1914 outlawed "unfair or deceptive acts or practices" in interstate commerce. Now the FTC has

Copyrighted material

Build this attractive hutch easily and economically with Western Pine Region woods

Here's a piece of furniture that will be a welcome addition to your home. You can turn it out at a reasonable cost with Western Pine Region woods. And if you want to give it an authentic antique finish . . . brush on a solution of potassium permanganate, singe with a blowtorch, and apply a coat of clear varnish.

You'll find straight-grained, soft-textured Western Pine Region woods easy to work with hand or power tools. They're always well dried and seasoned, take any paint or stain with ease, or can be waxed and rubbed to a natural glow.

For your next remodeling or furniture job, contemporary or traditional, choose Western Pine Region woods. You'll find them in knotty or clear patterns. Talk it over with your lumber dealer. He'll be glad to give you an estimate.

FREE! "Friendly Home Ideas" — 85 photographs, many in color, feature traditional and contemporary ideas for building, decorating and remodeling with Western Pine Region woods. Write for your copy to WESTERN PINE ASSOCIATION, Dept. 314-L, Yeon Bldg., Portland 4, Ore.

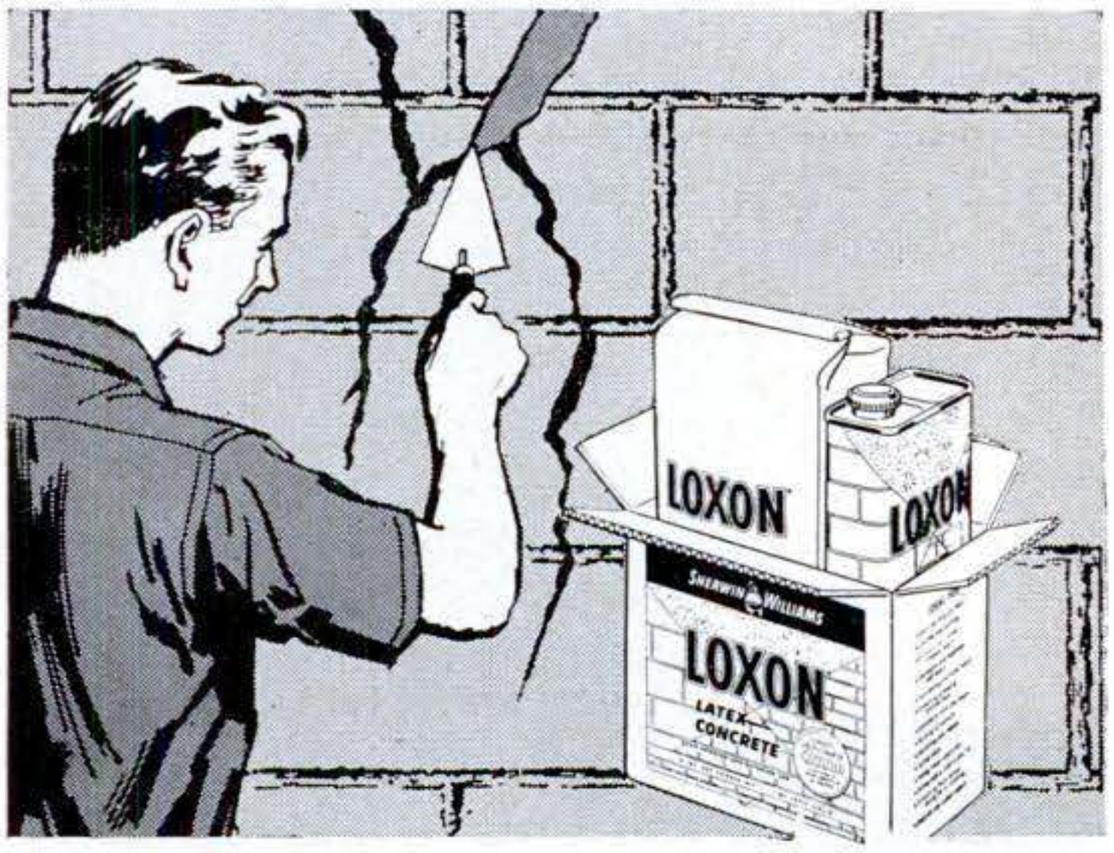
Western Pine Association

member mills manufacture these woods to high standards of seasoning, grading and measurement

Idaho White Pine • Ponderosa Pine • Sugar Pine
White Fir • Incense Cedar • Douglas Fir • Larch
Red Cedar • Lodgepole Pine • Engelmann Spruce

Today's Western Pine Tree Farming Guarantees Lumber Tomorrow

CONCRETE REPAIRS that won't break loose!



LOXON LATEX CONCRETE patches holes and cracks in any kind of masonry . . . and does it easily, smoothly, permanently. Made of super-fine cement and finely ground glassmaker-quality sand mixed with pure liquid latex to provide amazing adhesion. Ideal for repairing foundations, floors, broken steps, brickwork and mortar. Superior to any other type of concrete repair material. At leading paint, hardware, lumber and department stores.

When you want the finest in Chisels INSIST ON SHARK BRAND

THE CHISEL FROM SWEDEN!

Cutting blade made from world-famous, tough Swedish Steel.

See Shark Brand at your hardware dealer. Write today for this booklet on the care and use of chisels.

TRADE MARK

Sandvik STEEL INC.

Saw & Tool Division

1706 Nevins Road, Fair Lawn, N. J.

In Canada; P. O. Drawer 1335, Station "O", Montreal 9.

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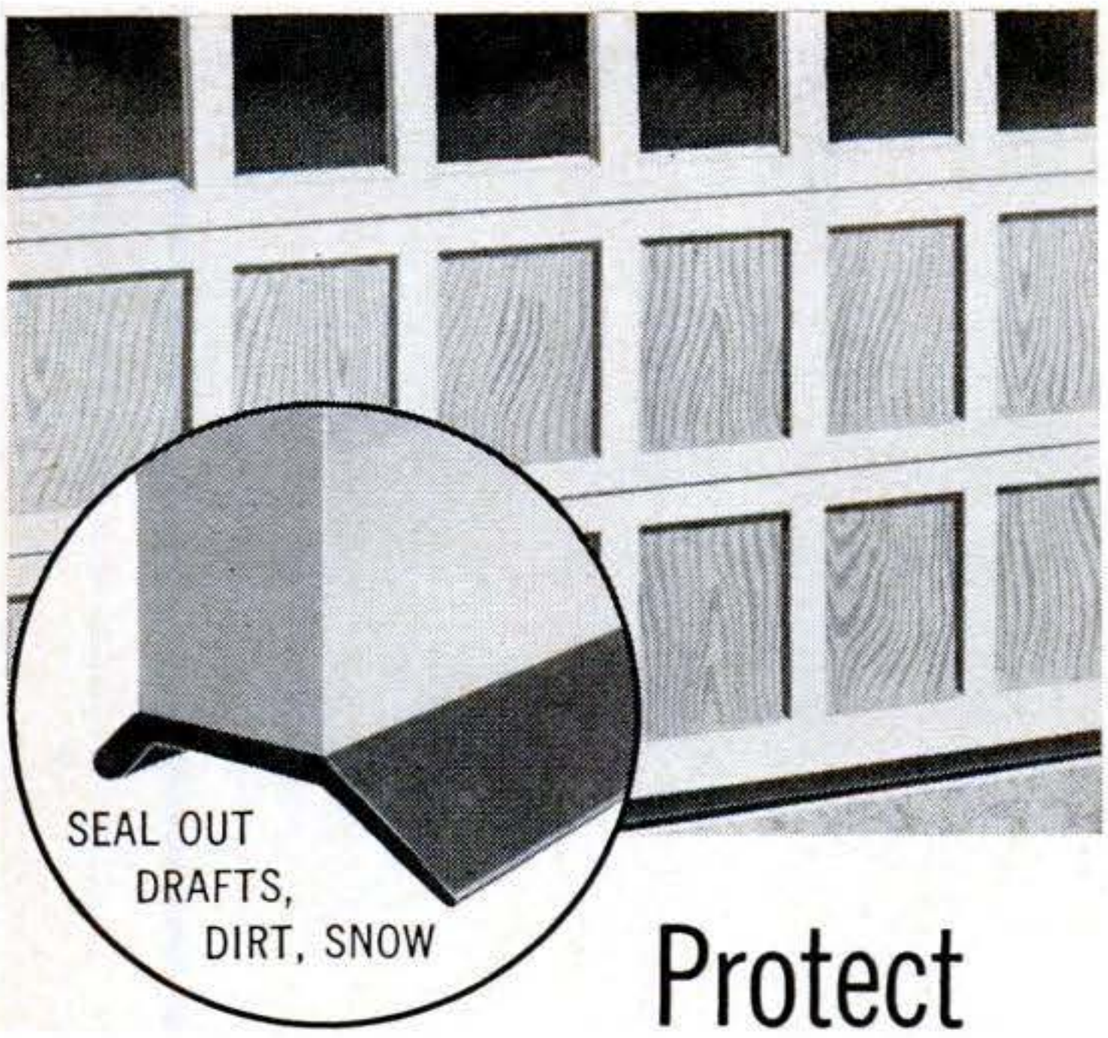

Protect costly garage doors with STANSTRIP*

Now . . . for less than $3.00 . . . in less than 10 minutes . . . you can put StanStrip on an 8-foot overhead garage door. And what a difference it makes!

The thick, rubber "pad" cushions the shock of closing . . . prevents damage to doors, spares the windows, ends the crash of closing.

And, just as important, the double lips of StanStrip flex to follow every irregularity in the floor . . . seal the opening completely against dust and dirt, rain and snow. Your garage stays cleaner, drier, warmer. Your car starts easier in winter.

And does it last! You just can't hurt StanStrip. The special rubber compound was developed from hundreds of formulas tested for this purpose. Stays flexible even in coldest weather. Get StanStrip now at hardware and building supply stores.

SEAL HOUSE DOORS, TOO

Ask for DrafTite*. . . an exclusive combination of silicone-treated wool-pile fibers and aluminum. It's the most effective house-door weatherstrip on the market.

*Trademark

The Standard Products Co.

LEXINGTON, KENTUCKY

Taking the Trickery Out of Tire Ads

officially catalogued some of the practices it considers unfair and deceptive. So anyone who uses them is on notice that he's breaking the law.

Yet terrible as this may sound to the ordinary citizen, it can't be assumed that tire companies automatically tremble at the thought. The FTC is widely regarded as a toothless giant: It doesn't have a very sharp bite. If it decides to lean on an offender, however, it can in time usually make him say "uncle."

It hasn't always chosen to do so. Over the years, deceptive tire-selling practices have repeatedly drawn FTC fire. Most shots have had the force of muskets loaded with soap bubbles. However, the fact that the FTC issued the Tire Guides on its own initiative is generally being read as a sign that this time the Government's trade arm means business.

If so, lawyers agree, it can ultimately have its way on most points, although the enforcement machinery at its disposal is slow and cumbersome. The ordinary routine of dealing with a resisting company may drag on for years through a series of complaints, conferences, hearings, rulings and court appeals.

Will the tire industry go along? And not merely in a reluctant, heel-dragging way? That's the best hope. It could happen because many companies would like to reform if their competitors would do the same. The FTC has created an opportunity for simultaneous cleanup.

In public statements most manufacturers have hailed the Guides and promised full compliance. John L. O'Brien, president of the Akron Better Business Bureau and a close observer of the industry, reports a "distinct impression" that they mean what they say.

There's no question in anyone's mind that a concerted effort by all manufacturers—or even by a few larger ones—could effect an enormous uplift in tire-selling ethics. Nor is there much doubt that improvement has to start at the top.

For one thing the FTC has little or no power over the local advertising that spreads most of the misleading price and quality claims. And as a practical matter it couldn't attack deceptive retailing in every town and hamlet. Fortunately it's not necessary.

Most local advertising is prepared and

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Sands Rust Off Metal

FLAT SANDER

Oscillating orbital motion produces a fine finish on all woods, metals, and fibres where hand sanding is usually employed. Better built by SIOUX, the tools the professionals use. $49.95

write today for Free Catalog.

ALBERTSON & CO., INC.
SIOUX CITY, IOWA, U.S.A.

SANDS WOOD SATIN SMOOTH

Starrett® TOOLS
the perfect gift

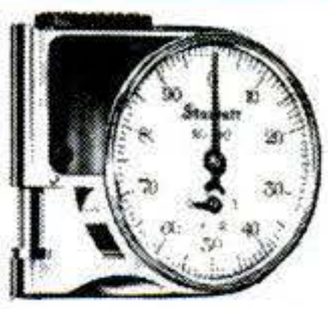
CRAFTSMEN for MECHANICS HOBBYISTS

The man or boy who loves fine tools always welcomes STARRETT tools. Choose the perfect gift for handyman, mechanic, skilled craftsman or hobbyist from more than 3000 STARRETT items — at hardware tool stores or industrial distributors.

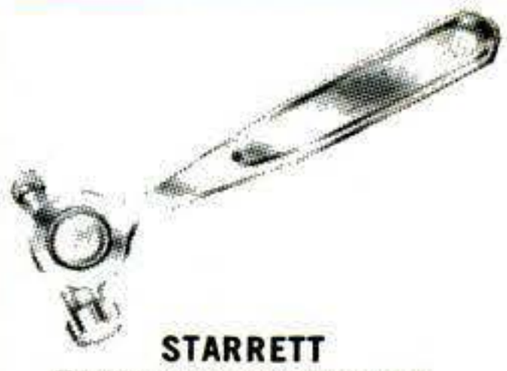
STARRETT TOOL CHESTS
Mechanics' tool chests in wood or metal — available with or without Starrett tools.

STARRETT MICROMETER
No. 436 0-1"

STARRETT COMBINATION SQUARE
NO 11 12" blade



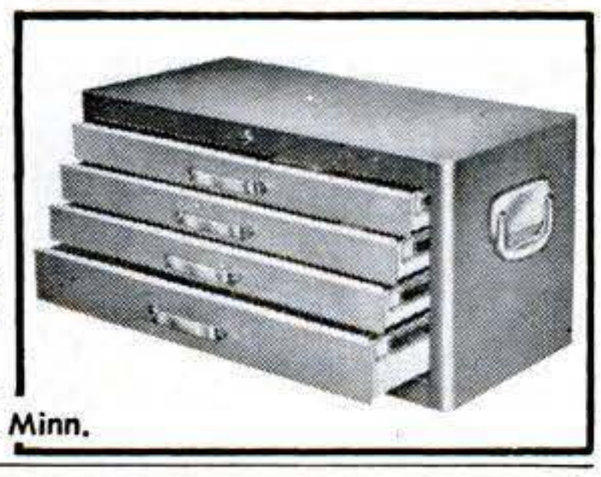
STARRETT DIAL INDICATOR POCKET GAGE
No. 1010 Range 0-⅜"



STARRETT TOOLMAKERS' HAMMER
No. 815
with magnifying glass

Heavy Duty, All Steel
TOOL CHEST
$25.90 F.O.B. ST. PAUL

WHERE ELSE can you get 4 drawers with *built-in-locking system*, sliding on compound glides—at this price! Baked blue-gray or red enamel. 26" x 12½" x 12¼". Your money back if not satisfied! Write for bulletin, describing 12 other models.



HUOT MANUFACTURING CO.
532 No. Wheeler St., St. Paul 4, Minn.

NEW! FREE CATALOG

HYDRAULICS
FOR FARM & FACTORY

PUMPS
FOR FARM & INDUSTRY

GENERATORS
FOR STANDBY POWER

Also Compressors, Motors etc.
New & U.S. Gov't. Surplus

Send for Free Illustrated Catalog of hundreds of bargains of Top Quality Items

GROBAN SUPPLY CO.
1139H So. Wabash Ave. Chicago 5, Ill.

Give a STARRETT Gift Certificate

Make your gift precisely right with a Starrett gift certificate available at your distributor's . . . or send for Starrett Catalog No. 27. Use the coupon.

THE L. S. STARRETT COMPANY
Dept. PS, Athol, Mass., U. S. A.
Please send free copy of Starrett Catalog No. 27 describing the many Starrett Tools recommended for Christmas and year-round giving.

Name.....

Address.....

City.....Zone.....State.....

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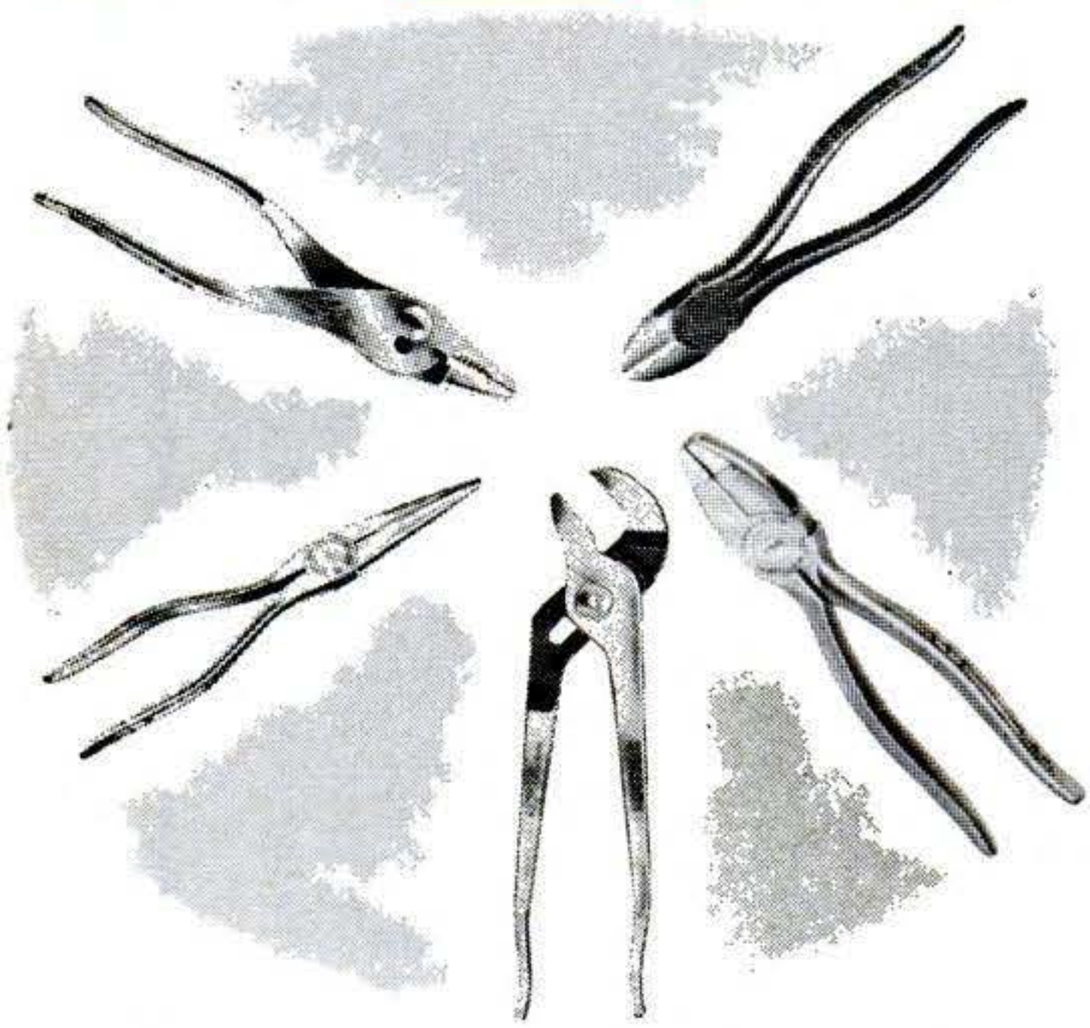
You'll

DO THE JOB EASIER WITH THE RIGHT PLIER

CHAN NEL LOCK



Full Polish Finish Quality Pliers

Any job is a hard job without the right tools. These special purpose Channellock quality pliers will help you do hundreds of jobs easier, faster. They're precision-built of high grade drop forged steel to last longer, work better. And you'll like the gleaming, full-polished finish at no extra cost.

Ask for Genuine Channellock pliers by name. Look for the trademark on the handle.

CHAMPION DeARMENT TOOL COMPANY
MEADVILLE, PENNSYLVANIA

partly paid for by manufacturers and distributors. They are all engaged in interstate commerce and easily reachable by the FTC. The same people are also accountable for deceptions based on misleading names and prices.

Slippery operators who manage to wriggle through the FTC's jurisdictional net may find other hooks waiting just beyond. The Guides provide a basis for enforcing many existing state laws against advertising deception. Better Business Bureaus are primed to use them in stepped-up local campaigns. Reputable newspapers, radio and TV stations now have a justification for screening objectionable advertising. Many independent retailers, weary of competitive bloodletting, have formed city-wide associations to police tire advertising. The National Tire Dealers and Retreaders Association (which had a big hand in formulating the Guides) has made country-wide plans.

The initial impact of the Guides (which went into effect at the end of the summer) has been largely on the plus side. Spot checks in several cities show advertising improvements ranging from a token nod in the direction of truth all the way up to full compliance.

They also show a considerable amount of evasion and at least one area of total resistance: To implement its rule against deceptive names, the FTC urged tire firms to attach explanatory stickers to present stocks of second- and third-line tires bearing such names as Deluxe Super Standard. So far, no soap: no stickers.

But new, less misleading titles are in the works. One major maker has promised a complete change in molded-in names. Others are expected to follow.

In spite of lingering reservations, holdbacks, and outright defiance, the FTC Guides should help you figure out what tire ads do—and don't—offer. You can expect to find more facts spelled out more often. It's up to you to understand what they mean.

Continue to be extra careful when you shop for bargains. No government order can eliminate slick salesmanship or take the place of good judgment. Tire values are pretty stable, and as a favorite Better Business Bureau slogan points out, if a sale looks too good to be true, it probably is. END

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New G-E "Golden Classic" stereo-magnetic cartridge

"GOLDEN CLASSIC" Model GC-7 (shown above) with .7 mil diamond stylus $23.95*
"GOLDEN CLASSIC" Model GC-5 (for professional-type tone arms) with .5 mil diamond stylus $26.95*
"STEREO CLASSIC" Model CL-7 with .7 mil synthetic sapphire stylus $16.95*
*Manufacturer's suggested resale prices

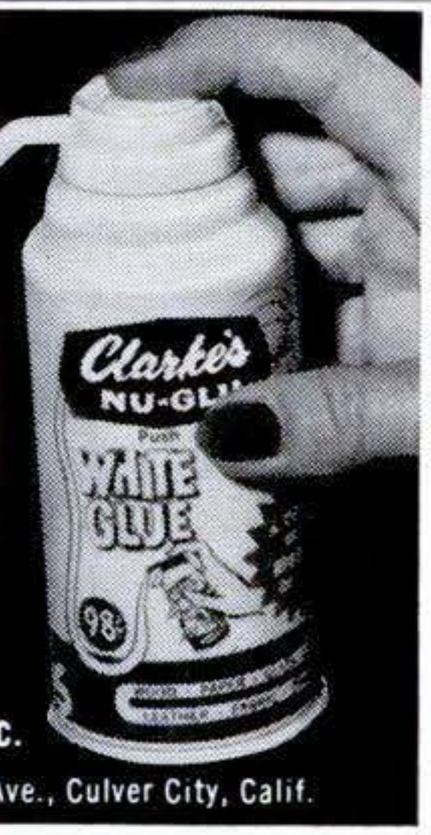
For matchless reproduction, use with G.E.'s new "Stereo Classic" tone arm. Write for complete specifications. Ask for a demonstration at your dealer's soon. General Electric Company, Specialty Electronic Components Dept., Section 82, W. Genesee St., Auburn, N. Y.

makes stereo a practical reality —at a very realistic price!

• Compatible with both stereo and monaural records • Full frequency response, 20 through 20,000 cycles • "Floating armature" design for increased compliance and reduced record wear. Effective mass of stylus approximately 2 milligrams • High compliance in all directions—lateral compliance 4 x 10^{-6} cm/dyne; vertical compliance 2.5 x 10^{-6} cm/dyne • Recommended tracking force with professional-type tone arm 2 to 4 grams • Consistently high separation between channel signals. (Specifications for Model GC-5).

GENERAL ELECTRIC

PUSH-BUTTON MAGIC



Clarke's NU-GLU

EXTRA STRONG
FAST DRYING
Ideal WHITE GLUE for
WOOD • PAPER • CHINA • PLASTIC • ETC.

Dyna-Therm Chemical Corp., 3813 Hoke Ave., Culver City, Calif.

It's easy as d-e-f-t

WOOD FINISHING

deft® WOOD FINISH BAR TOP

A clear, semi-gloss rubbed-effect finish. Deft alone does the entire job from raw wood to bar top finish. Will not darken. Dries in 30 minutes. Professional results every time.

Wherever paints are sold, or write for folder
DESMOND'S 1826 W. 54th St., Los Angeles 62, Calif. Dept. PS.

Rare, Fancy & Imported Woods ... Veneers ... Plywoods Mouldings ... Patterns ... Hardware ... Mosaic Tile Ornaments ... Tools ... Archery and Skiing Supplies

Everything You Need in Craftsman's New WOOD and Home Workshop CATALOG

Get Yours! Rush Coupon Today!

132 pages

OVER 1,500 ITEMS

NEW TOOLS: Upholstery Materials; Lamp Parts; Metal and Wood Legs; Cabinet Hardware; Music Box Movements; Archery and Water Ski Kits.

NEW—MOSAIC TILE PROJECTS!
World's Largest Selection of Finest Domestic and Imported Woods .... Mouldings, Hardware, Tools — ALL AT LOW MONEY-SAVING PRICES!

Your complete wood buying guide and project book. Craftsman is your best, most complete source of finest kiln-dried domestic and imported woods, beautiful wood inlays, colorful bandings, matched plywoods, embossed mouldings, carved ornaments, newest woodworking tools, "hard-to-find" cabinet hardware; more than 1,500 items! Packed with newest scroll saw patterns, project ideas and money making plans. Enclose 25c (refunded with first order) to help pay mailing and handling cost. Write TODAY to

CRAFTSMAN WOOD SERVICE CO., Dept. B-11, 2729 S. Mary St., Chicago 8

CRAFTSMAN WOOD SERVICE CO., Dept. B-11
2729 S. Mary Street, Chicago 8, Ill.
Enclosed find 25c. Rush new CRAFTSMAN WOOD CATALOG.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

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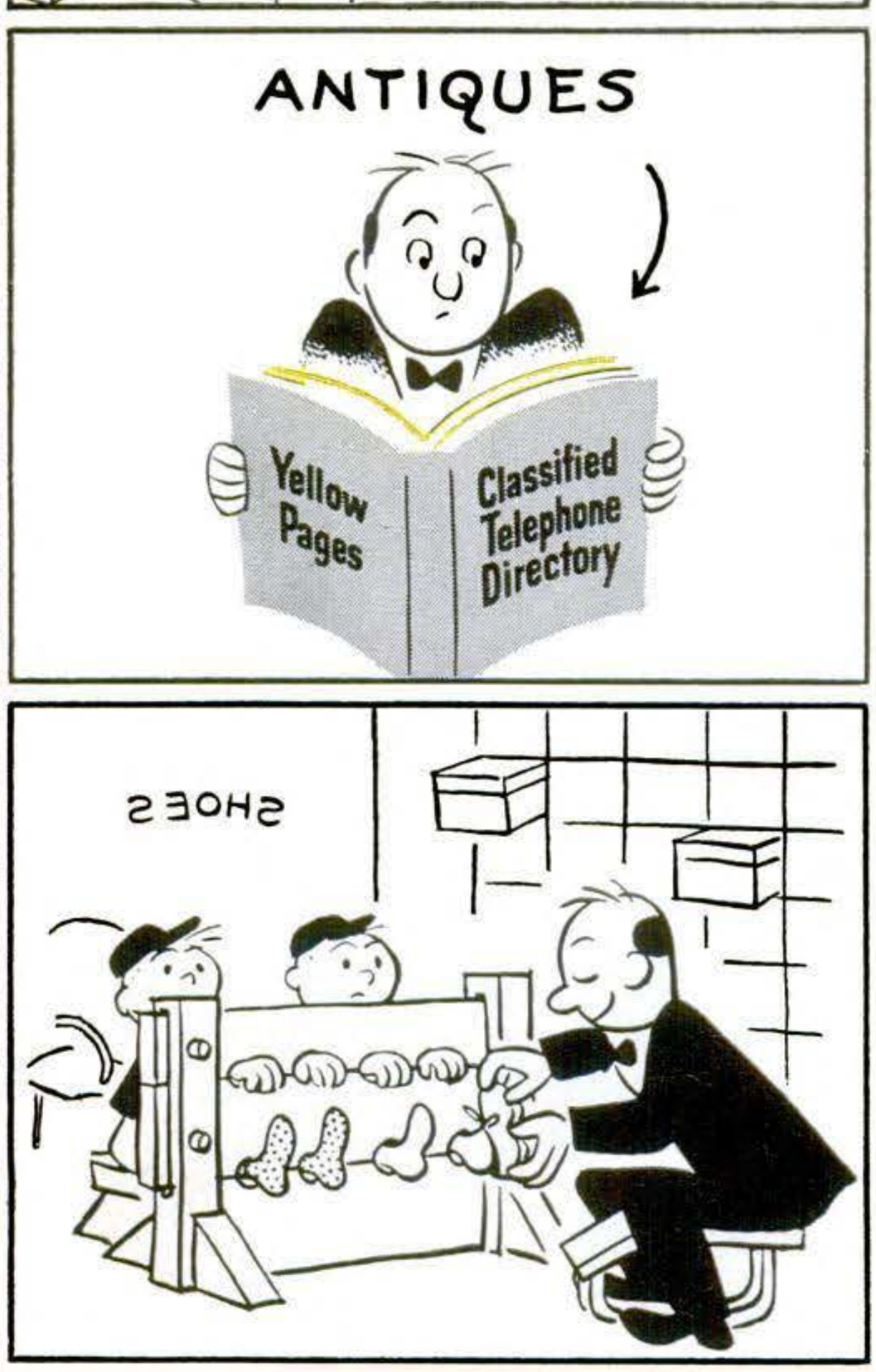
ANTIQUES



shoes, florists, tires, schools, bowling, plumbers, machine tools

whatever you need—

Advertisers displaying this emblem make your shopping easy.

Muffling the Roar of the New Jetliners

[Continued from page 128]

over the ejector cuts the previous thrust loss during takeoff to zero.

Passengers on the new jetliners will find that the seats up front are the quietest places to sit. This is just the opposite of what we are used to. But even the riders farthest back will be aware of unfamiliar quietness.

This is partly because the sound-suppressors have changed the character of the turbulence behind the engines and have prevented it from colliding with the outer walls of the cabin. Partly it is because cabin insulation is concentrated toward the rear of both the 707 and DC-8.

Even so, it is a most curious fact that the insulation is needed not so much to shut out engine noise as to stifle an odd new sound produced by jet speed. This is called boundary-layer noise. It is comparable to the rush of foaming water past the hull of a racing yacht, and it is caused by the ultra-swift passage of the plane's body through the air. The 707, for instance, cruises up to 605 m.p.h.

The volume of boundary-layer noise is such that even if the plane's inboard engines were to be shut off during flight, no passenger would know the difference, engineers of both companies say.

But so well have the outside sounds been muffled that the engineers have even had to squelch the whistle of the two planes' air-conditioning systems, to prevent it from annoying the passengers.

One jet sound still uncurbed—though both Boeing and Douglas are at work on the problem—is compressor whine, a high-pitched scream that rises when the engines gulp torrents of air through fixed vanes and whirling turbine blades in their throats. This goes on constantly while a jet engine is in use, but aloft the sound is of such high frequency as to be beyond all hearing. It is a problem only on the ground, when the engines are started and warmed up and the planes are taxiing.

Compressor whine attenuates fast and will never be a community nuisance. Windows and walls shield airport visitors and airline customers from most of it. To prevent passengers from wincing at the whines of neighboring jets while they are walking toward their own, some airlines are planning to conduct them aboard through movable tunnels. END

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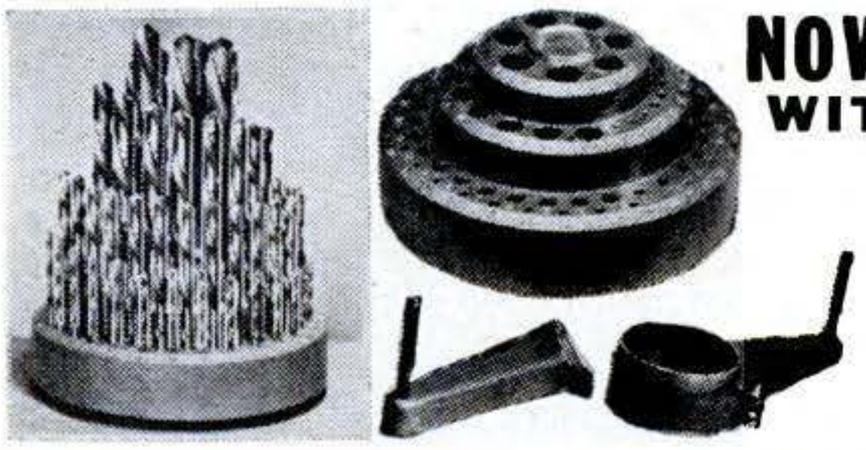
Up to 35 miles per gallon with this Prefect model

Compare its low price with any other leading import!

Slip easily through traffic, park in places most cars must pass by. Yet four people ride in comfort. For further information write: Imported Car Sales, Ford Motor Co., 34 Exchange Place, Jersey City 2, N. J.

Made in England for Ford Motor Co., Dearborn, Mich. Sold and serviced in the U. S. by its selected dealers.

English FORD Line



NOW! KEEPS DRILLS at Your FINGER TIPS
WITH "LAZY SAM" REVOLVING DRILL STAND

Easiest, fastest way yet to locate drills. Drill you want is always in front as stand spins freely on tip-proof base. Compact, yet holds 2 full sets. 1 to 60 and 1/16th to 1/2 by 64ths. Positions marked in large, easy-to-read numbers. Sturdy, metal construction. Complete with table top stand. Mounting brackets available for drill press or wall. Order Now! Cash with order ppd; COD postage extra. Dept. PS-11

TASK-AID CORP. 2627 S.E. HOLGATE BLVD. PORTLAND 2, OREGON

Drill Stand	$4.50
Drill Press Bracket (for 2½ x 4" column)	$2.85
Wall Bracket	$1.95
SAVE! Order all 3 for	$8.95

Beautiful BRASS LEGS...for Remodeling Tables, TV Sets, Cabinets, Furniture, etc!

Complete Kits have 4 slim tapered legs (with self-leveling tips), brackets for straight or slanted positioning of legs. SEE your hardware or lumber dealer . . . or send check or money to:

PRICES

3"	$6.80	6"	$7.10
9"	7.90	12"	8.45
14"	8.95	16"	9.20
22"	11.50	28"	11.95

Prices include postage plus FREE SCREWDRIVER!

WILKENSON MANUFACTURING CO., 5343 W. Lake St., Chicago 12

GENUINE ALNICO MAGNETS

AMAZING, PERMANENT, NON-ELECTRIC. HIGHLY PRACTICAL.
Conduct interesting experiments. Hundreds of uses. Retrieve valuable steel items such as guns, tackle from fresh or salt water; tools from tanks & drains. GUARANTEED. Try any magnet one week. Money back if you are not well-pleased.

No. S-710	(Wt. 53 oz.) Has pull of 225 lbs. on steel block	$18.00
No. S-625	(Wt. 70 oz.) Has pull of 125 lbs. on steel block	$10.00
No. S-575	(Wt. 18 oz.) Has pull of 75 lbs. on steel block	$ 7.00
No. S-500	(Wt. 13 oz.) Has pull of 50 lbs. on steel block	$ 5.00
No. S-300	Kit of Flat Bars 5 Pairs (10 Magnets)	$ 3.00
No. S-250	Kit of Round Rods 5 Pairs (10 Magnets)	$ 2.50
No. S-47	Hot Pad Magnets. 10 for $1.00	50 for $ 4.87
No. S-35	Hobbyist assortment of 8 small magnets	$ 1.50

Send M.O. or check. We pay postage. Sorry no C.O.D.'s.

MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.

When Writing to Advertisers Please Mention Popular Science

THE CHRISTMAS GIFT FOR LIFETIME ENJOYMENT

WELD IN A JIFFY! IT'S DYNAMIC

Now any one can weld, cut, braze or solder almost any metal quick, safe and easy with this professional type welder. Make repairs in home or shop and farm; repair auto bodies and fenders, build wrought iron furniture, railings, fences, etc. — 1001 metal items. No previous experience necessary. Designed to operate on any properly wired 110 V. A.C. line. Order today! Literature on larger industrial equipment on request.

EASY PAY PLAN
Low down payment. Pay as you USE, Money back guarantee. Act now!

only $38.50 f.o.b. Factory

DYNAMIC WELDER COMPANY, 1808 S. Federal St., Dept. D3-M, Chicago 16, Ill.

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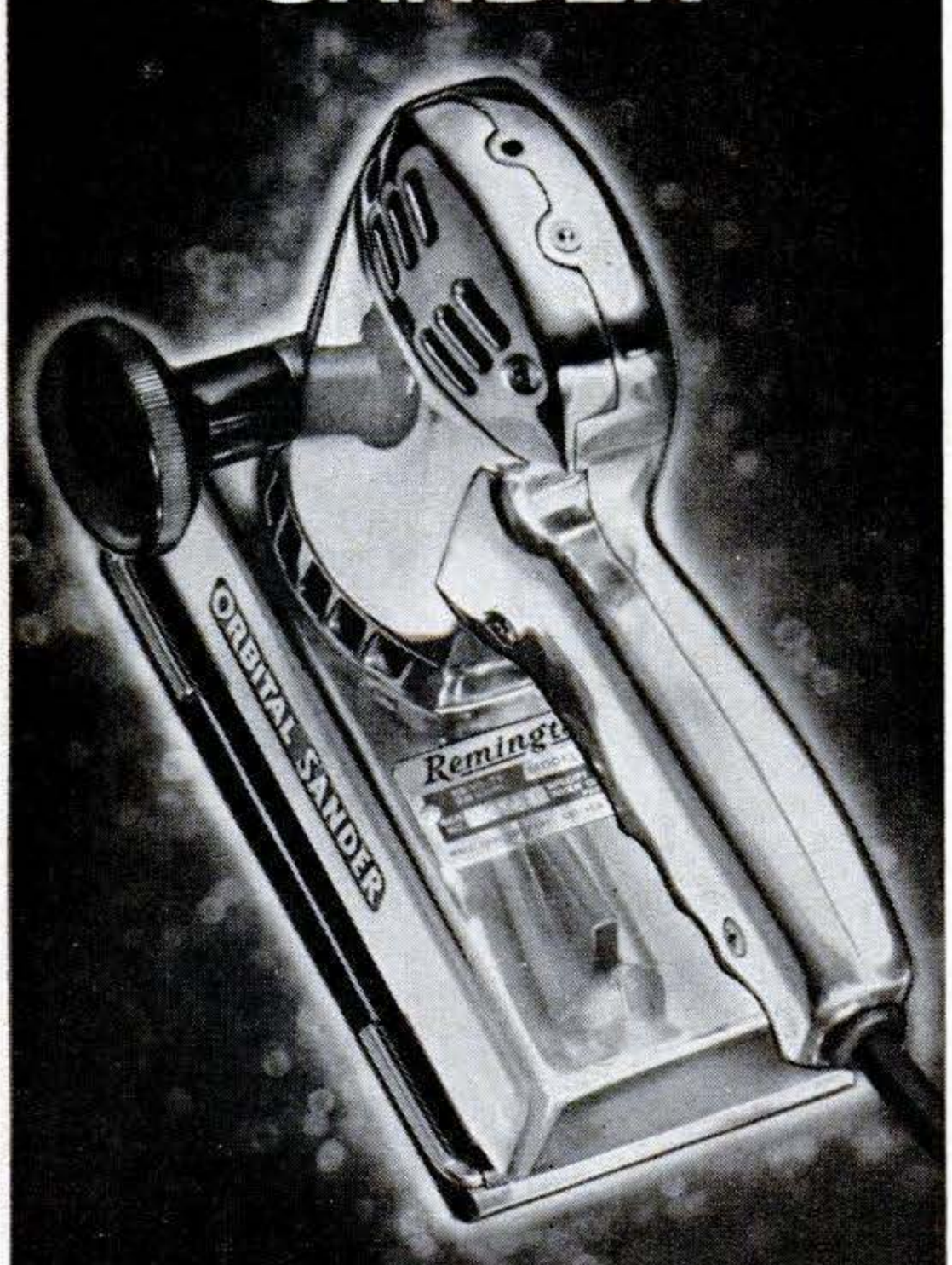
MODEL 25
Remington
SANDER



Gives satin finish in just seconds

For a professional, satin-smooth finish without tedious hand sanding. Heavy-duty, but lightweight. Special quick-acting clamps make sandpaper changing easy. With sandpaper, 3-conductor cord and adapter. See it at your dealer's . . . only $49.95.*

FREE CATALOG on full line of Remington Tools. Write: Remington Arms Company, Inc., Bridgeport 2, Connecticut—famous for quality since 1816.

DU PONT

*Specifications and price subject to change without notice. Price slightly higher in Canada.

FREE! NEW fully illustrated catalog of Remington drills, saws, sanders and other power tools. Send coupon today.

Remington Arms Company, Inc., Bridgeport 2, Conn. PS-11

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

[*Continued from page 105*]

Phillips, "no one will take it seriously."

So what? Your hearers want to know what they're supposed to do. "Always ask for a specific response from your listener," Phillips says. "Before you get down to the meat of what you have to say, tell him whether you want him to sign an order, or change a rule, or what."

As far as possible, never tell anybody anything on the basis of general interest: "They have an interesting production setup over at XYZ Company . . ." This doesn't tell the listener what his response is supposed to be. It doesn't even give him a valid reason for listening; he isn't obliged to believe your statement that it's interesting. Instead: "They have some production ideas at XYZ that we might be able to use to save money . . ."

How to say it

The advice of experts on how to speak is very simple: Speak naturally, just as you speak to your wife across the dinner table or your neighbor across the backyard fence. Never try to use a word, posture or gesture that you, personally, wouldn't normally use in everyday conversation. As you gain new speaking facility, use it in all situations—not just in your job.

Admittedly, it's not easy to sound poised and natural before an unfamiliar face, or a room or auditorium full of them. Maybe you freeze. You don't know what to do with your hands and feet. Your voice comes out as a monotonous mumble. Experts suggest many tricks to help you gain poise and liveliness. Here's the core of advice that they all agree on:

- Don't worry about tension; it's natural and useful. "A course in speaking should *not* put emphasis on making you feel at ease," asserts Phillips. "Nervousness makes your brain sharp and alert. Any time I'm not keyed up before a speech, I take it as a bad sign."
- Don't worry about diction. "We call something 'bad diction,'" says GE's West, "only when it's sloppy, over-precise, or otherwise so marred that it calls attention to itself—takes the listener's mind off what's being said. Otherwise, there is no right and wrong diction."
- Never memorize a speech. You'll on-

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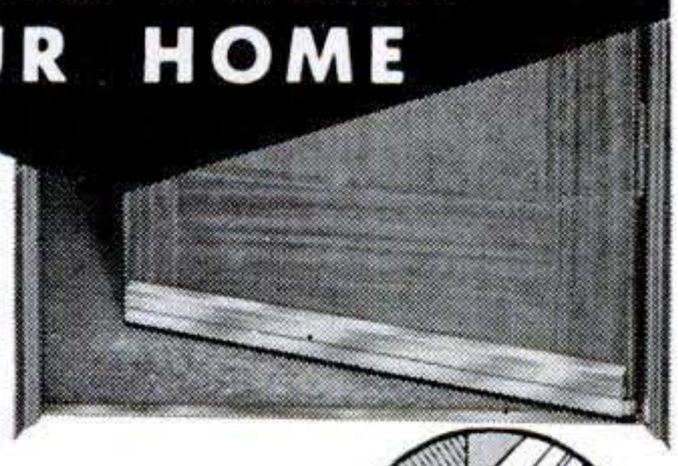
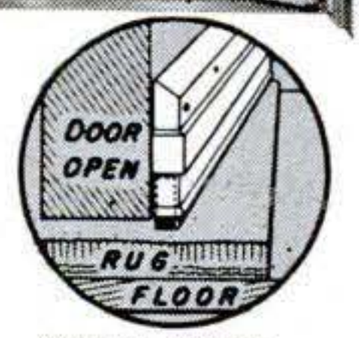
WINTER-PROOF YOUR HOME



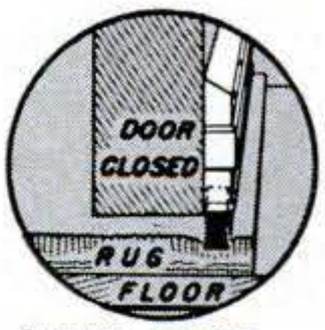
m-d
MACKLANBURG-DUNCAN CO.

Nu-GARD AUTOMATIC DOOR BOTTOM

RAISES AUTOMATICALLY WHEN DOOR OPENS!



WHEN DOOR OPENS . . . thick felt bottom raises automatically!



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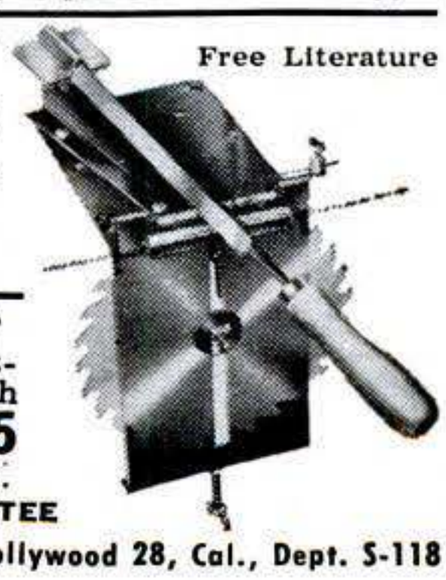

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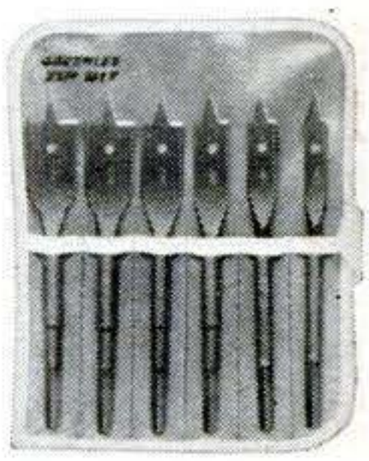

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ly create a new fear—that of forgetting a line. If you do forget one, you're in trouble. What's more, memorized words tend to take on a sing-song quality. Always speak extemporaneously, with an outline on a card if it's a long speech.

- Welcome the somewhat rough quality of your non-memorized words. As you grope for words, your speech acquires vividness that it couldn't have otherwise.
- Pause often—to collect your thoughts, to indicate a break between ideas, for dramatic effect. "Untrained speakers feel they have to fill every second with a torrent of words," says Drucker. "This is a mistake. In fact, the very first thing you should do, when you get up, is let a moment or two of silence slip by. Look your hearers in the eye. Wait till the coughing and chair-creaking stop."
- Use to the limit the advantage of spoken over written words—the fact that you have more than words themselves to work with. Gesture freely. Vary the tone, pitch and loudness of your voice. Walk around. If you're seated, lean forward when you want emphasis.
- Use "visual aids" freely. If there's a blackboard handy, scribble important points on it. Show models and diagrams. In small groups and private talk, illustrate what you're saying with anything that's handy—knives and forks, books, paper clips—or draw pictures on a scratch pad. "If they can see it as well as hear it," says Phillips, "they'll absorb it twice as well." What's more, the experts point out, having a visual aid to fool with will help you break a frozen posture.

"But probably the best advice of all," says West, "is contained in one word: practice." Force yourself into group speaking situations—preferably big groups where you're the only speaker and can't shift the burden of talk to someone else. One workable idea is to practice on kids at first; they're easier than adults to round up in big groups, and they're easier to please. If you offer yourself as a speaker on your job or hobby to the local high school or Boy Scout troop, you'll in all likelihood be welcomed with open arms. You'll be doing the kids a big favor—and yourself an even bigger one. END

This is the third article in a series on the Science of Personal Success. The next will appear in the December issue.

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Wearing protective gloves, this girl gently stacks Federal-Mogul engine bearings on a magnetized bar. Next step—final plating for these "jewels of the engine."

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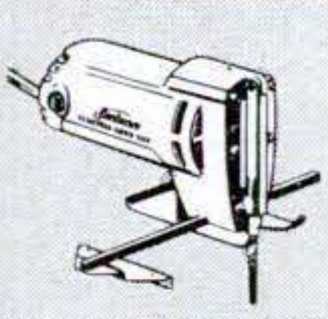
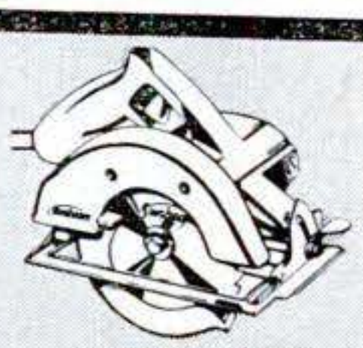


ELECTRIC HAND SAW
Rips, crosscuts, cuts circles and scrolls. With rip guide and blade. **$45.00**
***Pro. model—$55.00**



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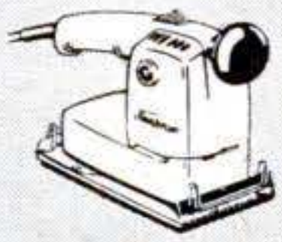

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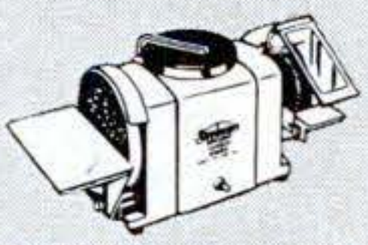

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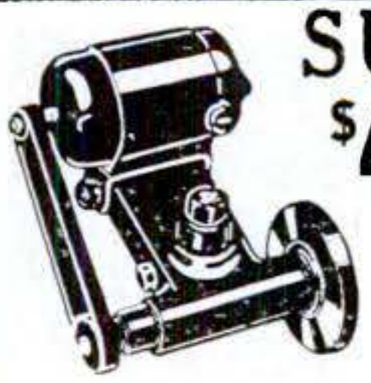

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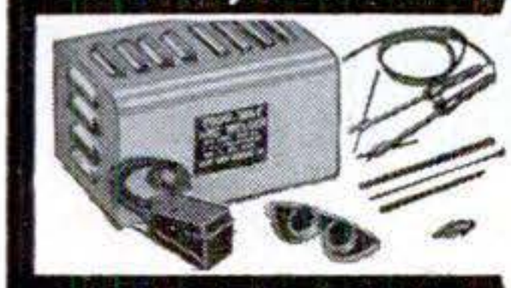

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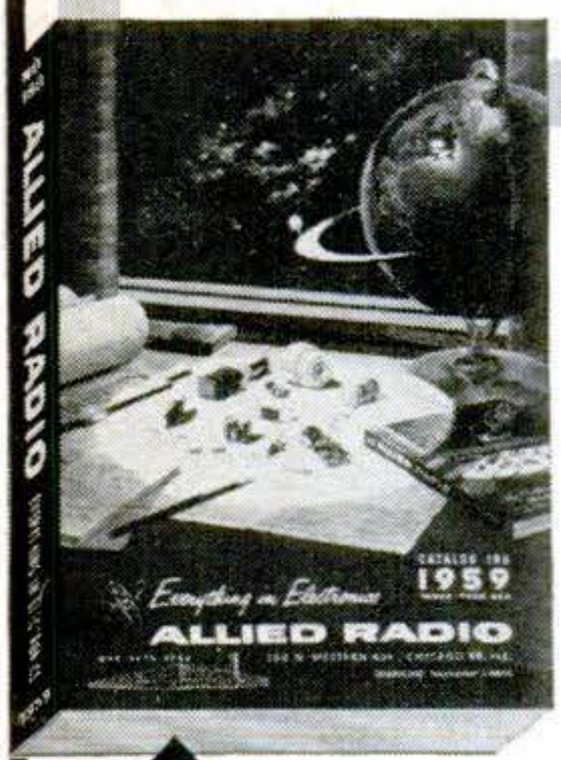

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New Drugs to Tune Up Our Brains

[*Continued from page 152*]

make people "live faster" and "burn out sooner."

Right now the pharmaceutical industry is in an all-out race to discover still better energizers. Those now being tested under such code names as JB 516, Ro-0700 and Ro-1018, promise to have fewer of the unpleasant side effects, and to be quicker-acting than Marsilid.

Therefore, let's imagine that a few years from now there is a psychic energizer known to be completely harmless. And suppose that its effect on body chemistry is perfectly normal and natural. In that case, what about the healthy person who just wants more vim and vigor to go dancing—should he take it?

"Well," Dr. Kline answers, "why not?"

After all, nobody sees anything wrong about a dentist working to give perfect teeth. Why shouldn't a doctor try to give perfect metabolism?

The dazzling new hope that Marsilid reveals is that many human characteristics are related to chemical conditions in the blood and other body fluids. And what is controlled by chemistry can be influenced by drugs. Other likely possibilities, in addition to better energizers, include drugs to raise natural immunity to infections, control body size, increase muscular strength, or improve memory.

Drugs to postpone old age would be the most exciting of all.

Causes of aging aren't well understood, but hormones and other chemicals seem to influence the process. For example, there's a rare disease called progeria, believed to be related to the ductless glands, in which children of six or seven die with the wrinkled face and other symptoms of advanced old age. Possibly drugs can be found to give the opposite effect.

Some people manage to postpone old age a long time, like Chancellor Adenauer of Germany (82) and Rhode Island's Senator Theodore Francis Green (91). The great artist Titian still painted regularly until he died of the plague at 99. And remember King Masinissa.

Of course there would be complications if many people took to having children at 86, but it wouldn't be such a bad world if we could all look forward to eudaemonically painting away at 99. END

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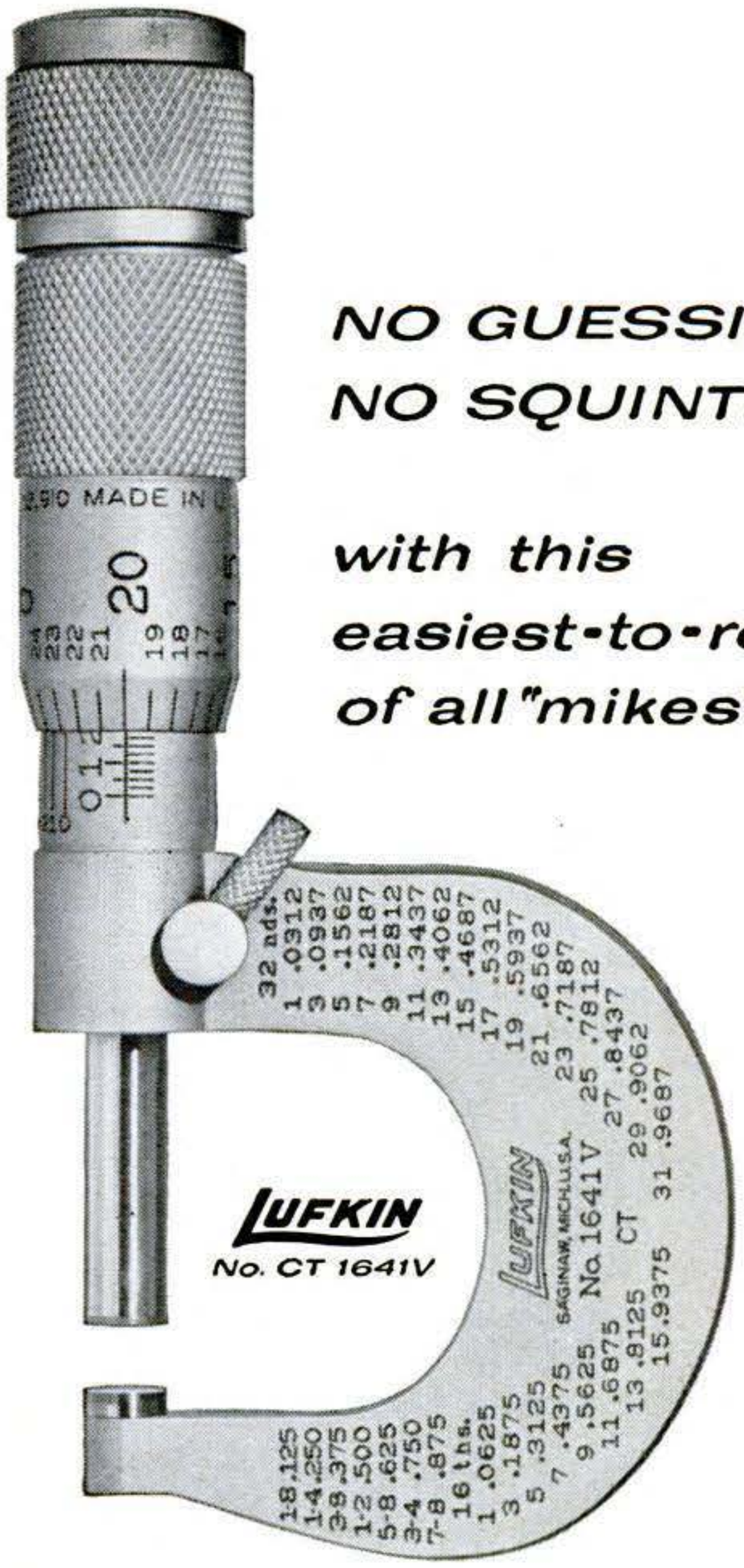

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The Most Fantastic Atom-Smasher

[*Continued from page 118*]

would be $230 a gram, or about $104,000 a pound.

The super-accelerator's projected half-ampere beam current would melt a target on which the beam rested steadily. So A-12's designers provided a magnetic "beam sweeper" to swing the 15-to-30-inch-diameter beam back and forth over the 14-foot-diameter target, like the electron beam on a TV screen. Water cooling would carry away the 665,000 kilowatts of heat—so much that there later was serious thought of recovering power from such a plant's heat.

For raw material A-12 would consume nearly 900 tons yearly of "depleted" uranium—already milked of much of the 0.7 percent of fissionable U-235 in natural uranium. Depleted uranium was what was left after extraction of U-235 for weapons at Oak Ridge's gaseous-diffusion plant. Spent uranium from Hanford's piles was another imaginable source. Use of depleted uranium, a principal feature of the new plutonium-making process, would have two novel consequences:

A-12 would be much "cleaner" radioactively than a reactor plant, because the depleted uranium would yield only ⅓ as much fission-product radioactivity. More important, turning leftover uranium into plutonium would make the country's then-limited supply of uranium go that much further.

By substituting different target materials, it was pointed out, such a plant could also make tritium for H-bombs; fissionable U-233, from thorium; and "radioactive warfare materials." AEC instructions, however, were to concentrate on weapons-grade plutonium.

Since A-12's super-accelerator was not a reactor, it could not possibly become critical or "run away." So it would be safe to operate this plant in a populous region within 30 miles of St. Louis.

Already under construction at Livermore, the Materials Testing Accelerator was intended to be a full-scale working counterpart of A-12's front-end section.

Since this was expected to be the most difficult part of A-12 to perfect, the Livermore machine would help solve problems, such as how to focus the beam in a straight path to the target. While the Materials Testing Accelerator would

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The Most Fantastic Atom-Smasher

make no plutonium, it would have a beam sweeper like A-12's and a water-cooled aluminum target, with devices to gauge the beam's current and behavior.

Exactly one veiled reference to this colossal machine was all that ever appeared in the AEC's Semiannual Reports, the most widely consulted source of public information on its activities. The report for July, 1950, contained this masterpiece of understatement: "An improved linear accelerator to be used for a classified research program is being constructed jointly by the University of California Radiation Laboratory and the California Research and Development Company."

Following acceptance tests of its components, the enormous Materials Testing Accelerator was operated for the first time in March, 1952—a dry run without injecting any particles for acceleration. In May the experimenters first succeeded in obtaining a proton beam. Protons, or lightweight hydrogen particles, easier to accelerate than deuterons, had been chosen for a beginning.

At first the great machine plagued its operators with displays of temperament. It gave them high voltage (eventually reaching 33,500,000 volts, end-to-end) but it worked erratically. They peered through periscopes into the interior and saw why. Lightning was playing intermittently between the copper drift tubes. Each arc shut down the machine for about 10 seconds—not long, but sometimes it happened frequently enough to consume 90 percent of the time.

Besides these fireworks, the drift tubes emitted invisible bursts of X rays, pale glows, and bright sparks branching into space. But it was the arcing that bedeviled the experimenters, and caused protracted shutdowns for repairs to the damaged drift tubes.

So things stood when, in August, 1952, the AEC canceled the A-12 construction program. It authorized the Livermore team to continue experiments with the Materials Testing Accelerator—but further work on the Weldon Spring plutonium plant was "indefinitely postponed."

No fault had been found in the plutonium-making idea, nor was the Materials Testing Accelerator's temperament to blame. A-12's cancellation, the AEC ex-

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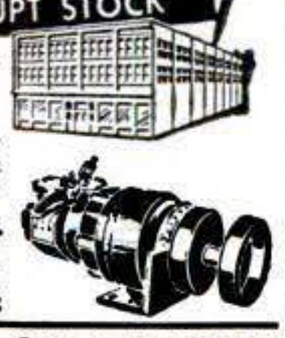

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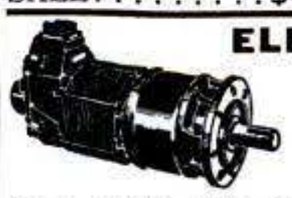

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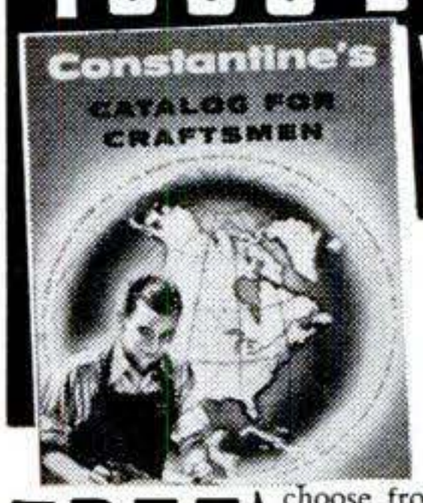

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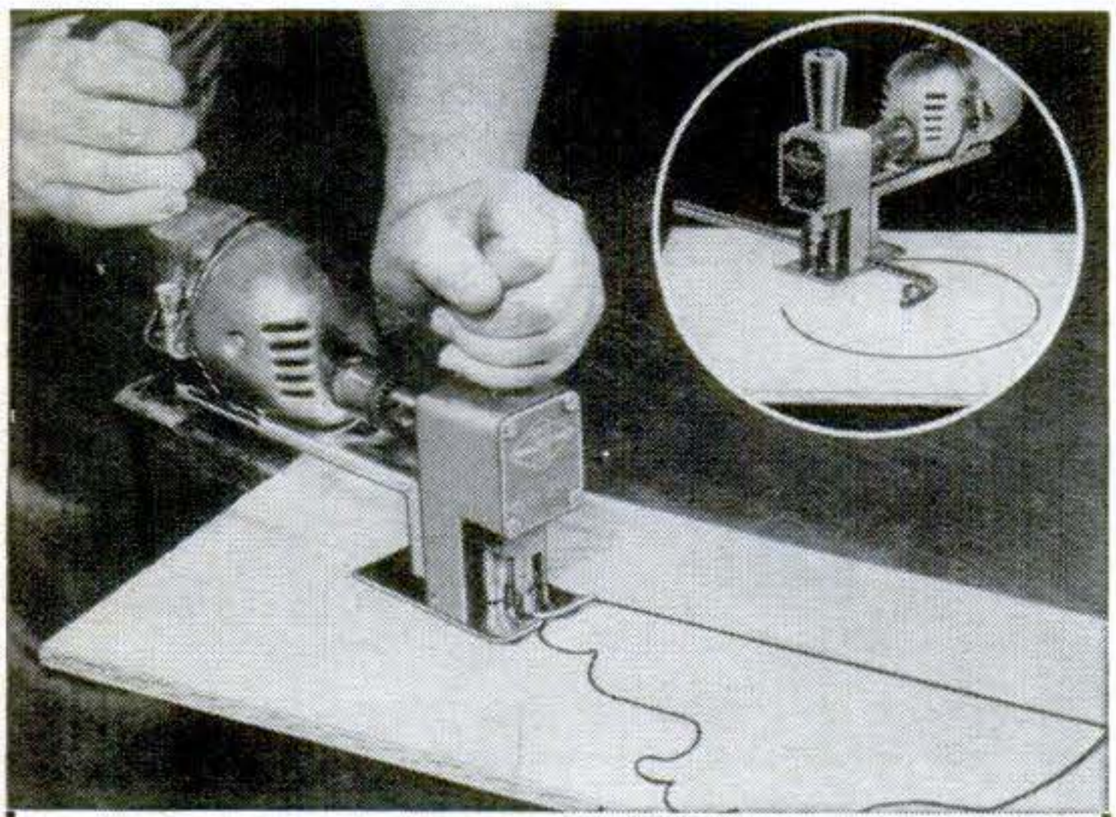

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The Most Fantastic Atom-Smasher

plains in reply to this magazine's inquiry, was simply "because of major improvements in the uranium raw-materials supply in 1950." Prospector Charles Steen's multimillion-dollar strike in Utah had just opened the first of vast new U.S. uranium fields; abroad, too, new sources were coming into production. Uranium had become abundant. And that had removed the major attraction of A-12 and its novel process—its ability, by using depleted uranium, to stretch the formerly limited supply.

To decide its ultimate fate, an AEC directive of November 6, 1952, set up a Reactor Design Evaluation Program to compare the merits of plutonium-making methods, including the electronuclear process.

Upon the continuing Materials Testing Accelerator trials, fortune now smiled. The Livermore team licked the arcing problem, mainly by rearranging the drift tubes. A 22,500,000-electron-volt proton beam, one of their objectives, was attained. Almost reaching their sky-high quarter-ampere goal, they achieved an intermittent beam current of a history-making 0.225 ampere—and lesser but still tremendous ones for long periods.

With trials completed, the dismantling of the great machine began in December, 1953. Based on the tests, a final report from Livermore in February, 1954, briefly reopened the idea of an accelerator plant to make plutonium.

The 1954 report presented a bold new plutonium-plant design, "C-50," which it called far superior to A-12. For the same output of plutonium, C-50 would cost half as much to build, and would cut the cost of the plutonium to $124 a gram or about $55,000 a pound.

C-50's 500,000,000-electron-volt accelerator would be 2,640 feet long; but need be no more than 11 to 14 feet in diameter, thanks to newly available high-power oscillator tubes of increased frequency. (Required diameter was inversely proportional to frequency; A-12 and the Materials Testing Accelerator had to be so large because of the limited frequency of the highest-power tubes available in 1950.) It would consume less power, and have a smaller beam and beam current, than A-12. Beryllium replaced uranium for the first target; the other two

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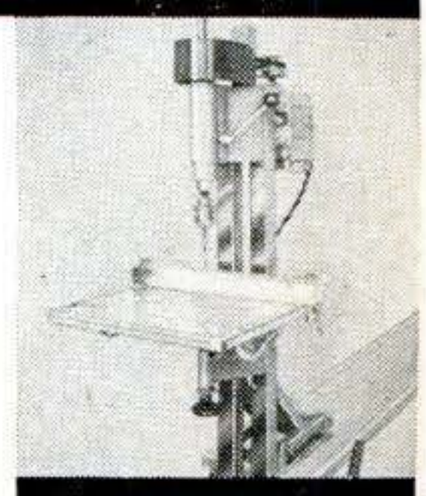

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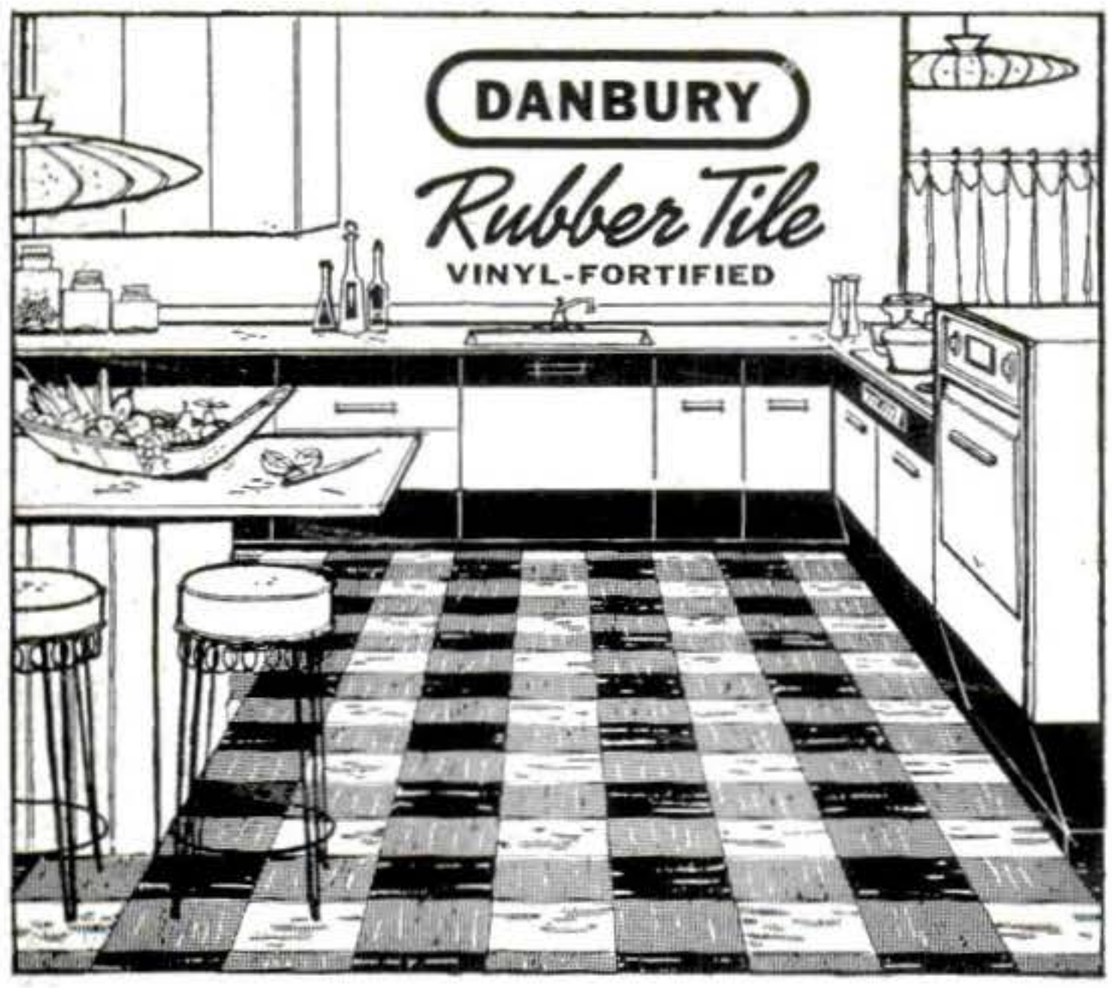

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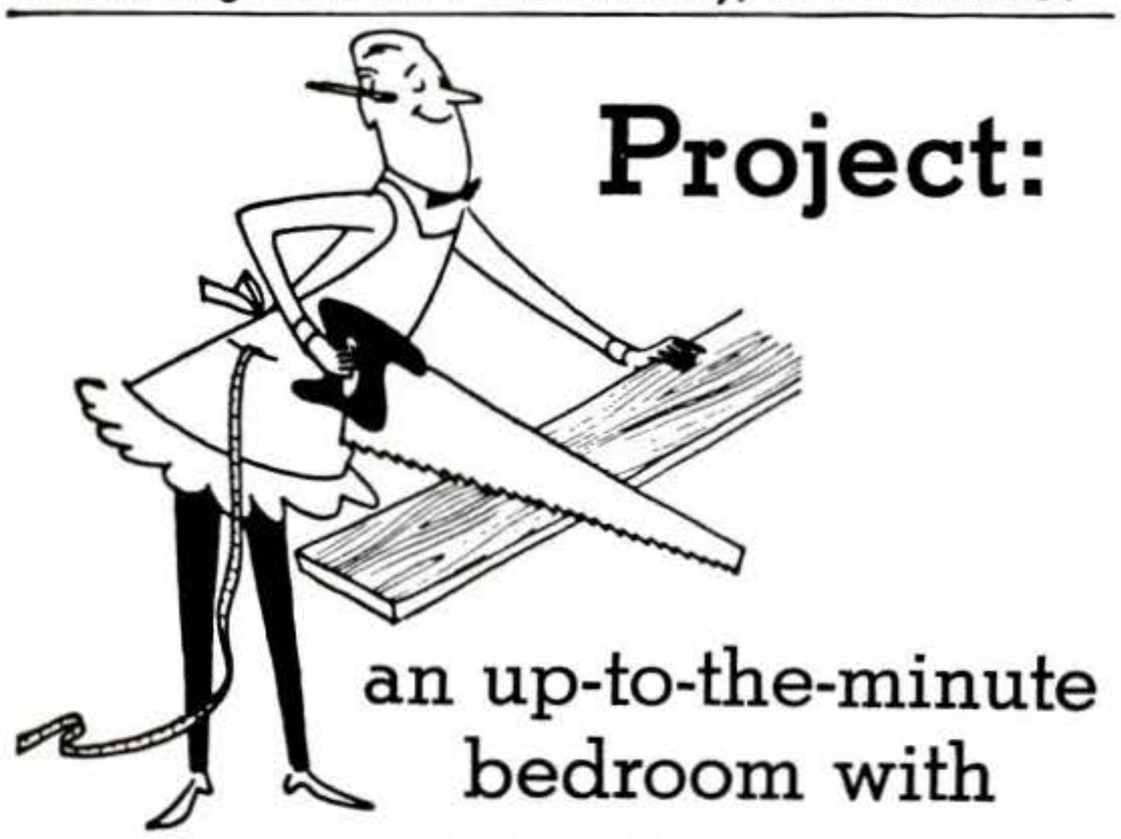

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The Most Fantastic Atom-Smasher would consist of uranium spheres, of half-inch and two-inch size, for gravity feeding. Liquid metal instead of water would cool the first two targets.

The final verdict on the accelerator process, whose future was now riding on the C-50 design, came from the Reactor Design Evaluation Program. It was unfavorable—for the same reason that had caused A-12's cancellation. And so ended the plan. For the AEC says that the electronuclear method, no longer needed, is now eliminated from consideration.

Today a new AEC plant refines uranium at the Weldon Spring site. The hangar-like Materials Testing Accelerator building at Livermore now houses H-power experiments. Eight great "production" reactors at Hanford and five at Savannah River supply the plutonium for U.S. weapons. Improved techniques have so reduced the cost that the AEC currently prices weapons-grade plutonium at no more than $45 a gram, about $20,000 a pound—a fraction of the cost from an A-12 or C-50.

From a military point of view the great secret "MTA Project" has passed into history—and its practical usefulness has proved to be peaceful, instead.

For the fantastic Materials Testing Accelerator made outstanding contributions to scientific knowledge. With its aid, as the AEC sums it up: "Important advances were made in vacuum and radio-frequency techniques; in the development of high-power tubes, ion sources, and focusing techniques in accelerators." And the accomplished feat of attaining a vacuum of only one ten-millionth of a millimeter of mercury in the biggest vacuum vessel ever built "had been achieved before only on a laboratory scale."

Already some of these advances have been put to good use, in the AEC's giant atom-smashers built and building today. And now the U.S., by releasing the long-withheld "MTA reports" from secrecy, has made their remarkable scientific data available to all. END

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Next Month: Which fuels will give our missile program a bigger boost—liquid or solid? Read: "The Battle of the Missile Fuels" in December PS.

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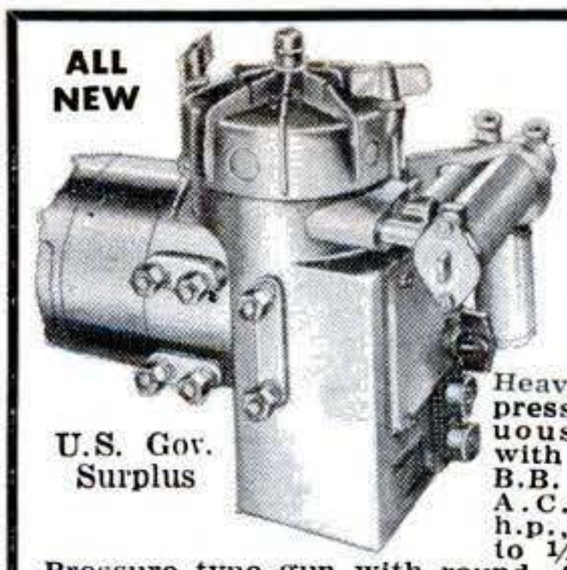

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PAINT SPRAY UNIT

Including Spray Gun

APPROX. ORIGINAL COST $325

OUR LOW PRICE $34.50 FOB Chicago

Heavy duty compressor for continuous operation, with G.E. or equal B.B. Motor, 110V., A.C., rated 1/10 h.p., develops up to 1/4 h.p. 1-Quart Pressure type gun with round, fan and ceiling spray nozzles. Line filter, air gauge, 20 ft. cord & plug, 20 ft. air hose. Sprays paint, lacquer, enamel, insecticides, etc. Paints house, auto, ANYTHING. Operates gun continuously. Instructions furnished. NOTHING ELSE TO BUY. Wt. 80 lbs.

ORDER FROM THIS AD. Money Back Guarantee.
Send check or money order.

ILLINOIS MFG. & SUPPLY CO.
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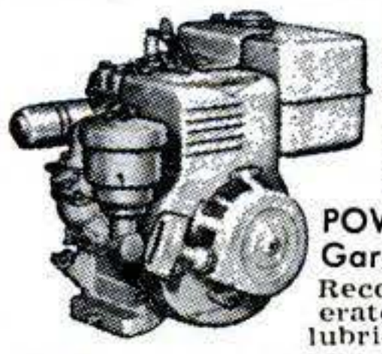
Convert Lawn Mowers into POWER UNITS with this
Brand New BRIGGS & STRATTON



2¾ H.P., 4-Cycle Gas Engine

SAVE! *Reg. Price $72.00 while they last* $42.50 fob

POWERS Farm, Home & Industrial Tools • Garden equipment • Pumps • Compressors

Recoil rope starting. Complete, ready to operate. Air cooled. Sure fire ignition. Positive lubrication. GUARANTEED!

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$1 METAL Pocket Rubber Stamps

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Indestructible. Custom Made. Inked and ready for instant use. Any 3-line text, 1/2" x 2" area. DeLuxe Model has 'Finger-Tip' Control, self-locking case.

DeLuxe $2

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Gasoline Fired

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Under chassis heater for car or truck. Road and other heavy equipment. Complete with fittings. 50,000 BTU. Used by Army to maintain starting temperatures under Arctic conditions. 10"x12', lightweight. Offers many uses. Instructions included. $9.50

Gov't cost approx. $40. While supply lasts, our price FOB K.C. ..... 2 for $17

SPECIAL: Explosion proof Marathon Motors 1/2 HP 3750 RPM. FOB K.C. $39.95

Write for latest surplus catalog . . . hundreds of items.

NATIONAL SURPLUS SALES CO.
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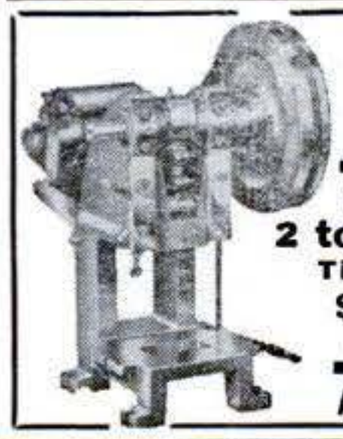


Heavy Duty Type ALLEN PUNCH PRESSES

Model B-2
2 ton - $97.50
Tilting model
$127.50
fob—less motor

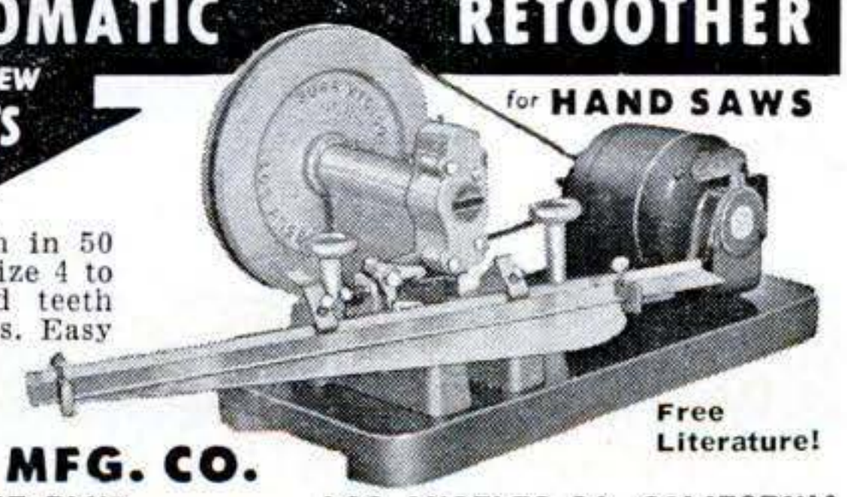
Hundreds of Different Model Combinations
1 to 12 ton capacities
Moderate in price
Fully guaranteed

See your supply dealer or write for Free catalog giving complete information and prices on our Heavy Duty Punch Presses.

ALVA ALLEN INDUSTRIES, Dept. PS, Clinton, Mo.

AUTOMATIC RETOOTHER for HAND SAWS

MAKES NEW PROFITS



Cuts new teeth in 50 seconds—any size 4 to 16 points. Old teeth fall off as chips. Easy to operate. A perfect job.

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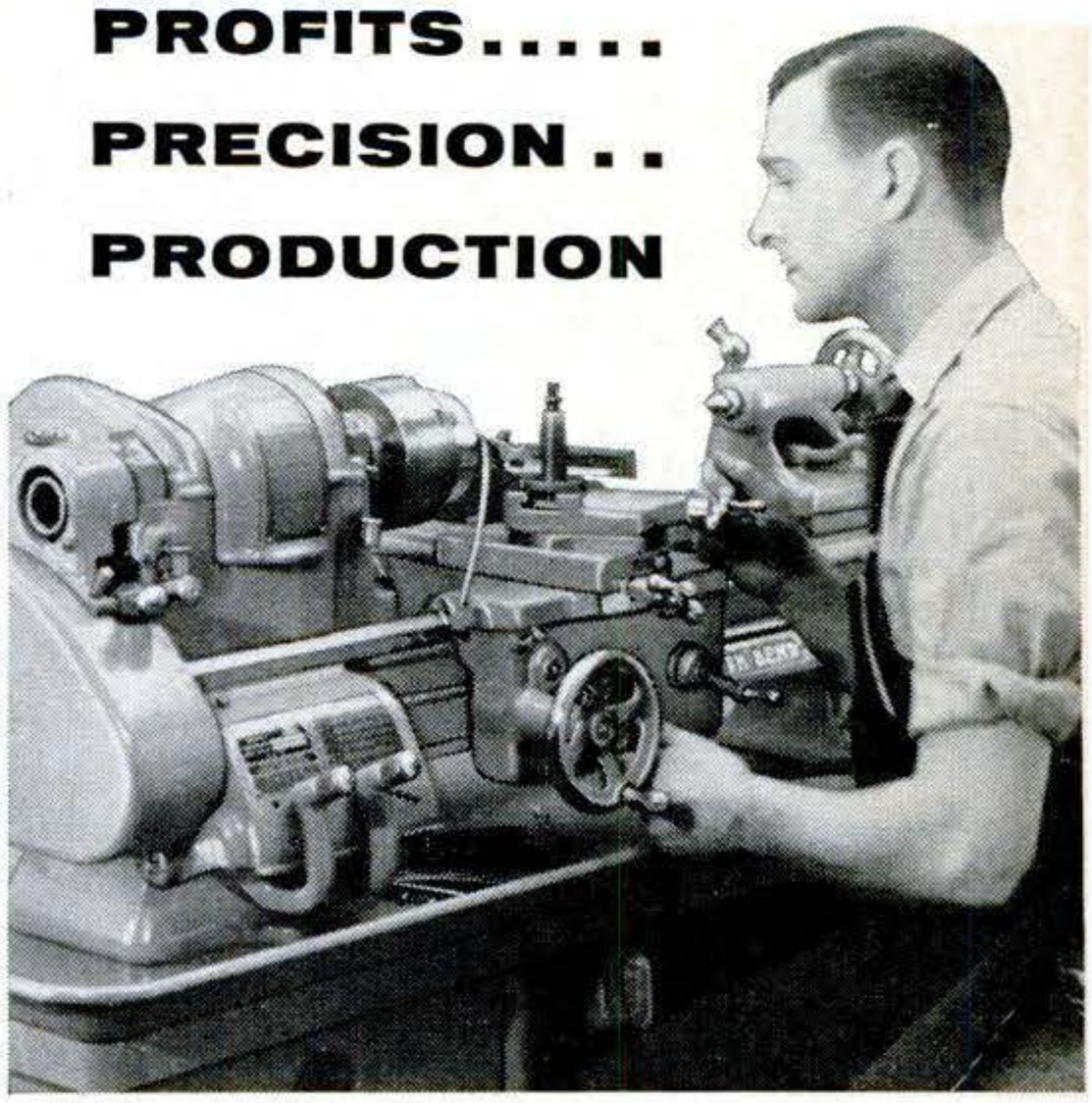
for PROFITS..... PRECISION.. PRODUCTION



BENCH LATHES-9", 10-K and 10" sizes in independent change gear, quick change gear and toolroom models.

FLOOR LATHES-9", 10-K, 10", 13", 14½", 16" and 16-24" sizes in quick change gear and toolroom models—129" maximum between centers on 16" lathes.

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MILLING MACHINE-Vertical spindle type with universal 360° swivel head.

BENCH SHAPER-7" stroke. Only shaper of this size with pressure lubrication system.

DRILL PRESSES-14" precision type in bench, floor and multiple spindle models.

PEDESTAL GRINDERS-8" and 10" wheel sizes. More room for work and for hands.

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FLEXIBLE SHAFT—ONLY

$6.50 P.P.

Fits all electric drills & hand power tools 35¾" long. Oilite bearings, core of specially wound, high carbon steel wire in flexible steel casing. Will accommodate tool shafts up to ⅛" dia. For lathes, electric drills, etc

TUBING CUTTER WITH SIDE-LOCK REAMER for ⅛" to 1" O.D. for cutting bronze, aluminum, or plastic. Hardened alloy steel cutting wheel **$1.75 P.P.**

10 HIGH SPEED STEEL REAMERS—Straight and Taper Shanks—all brand new and in excellent condition. Reg. $25.00 value. **10 for** . . . . . **$4.50** P.P.

7 H.S. and carbon drills from 6" to 12" in length. Assorted sizes up to ¼" diam. for drilling in hard to reach places. A reg. $10.00 val. for only **$1.95** P.P.

12 MOUNTED WHEELS and points on ⅛" Shank

$2.95 36 for 7.50p.p.

For grinding on plastic, wood, soft & hard metals. Regular Value $8.40. **18 Mounted points on 3/32" shank $2.50; 12 mtd. wheels on ¼" shank $3.60.**

18 Rotary Cutters

$5.85 P.P.

Assorted sizes cutters on ⅛" or 3/32" shank. Will fit all hand grinders. Ideal for cutting wood, metal, or plastic. Brand new.

ADAPTER CHUCK

With 2 interchangeable collets, opening from 3/32" to 0, on ⅛" mandrel. Price each only.. **$1.50** P.P.

12 India Silicon Carbide and Arkansas Stones—Squares, Rounds, Triangles. An assortment from 3½" long to 6" long. Fine, medium and coarse. A real $9.00 value. **12 for $4.25 P.P.**

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CLEANED INSTANTLY
SAVES PLUMBING BILLS—

CHICAGO—Nov. 1st. Just introduced is a Free Booklet on a New Discovery which enables the Home Owner, Janitor, or Factory Maintenance to clean any Clogged Sewer Drain.

Yet anyone can operate this new **Plumbers Flushing Gun** which releases air pressure on a solid shaft of water cleaning the most stubborn stoppages up to 200 feet. TOILETS, SINKS, URINALS, BATHTUBS, FLOOR DRAINS, and HOUSE-TO-STREET SEWERS clogged with Grease, Rags, Sand, Roots, and paper melt away instantly when struck by the Hammer-like blow of this new unit.

There is no need to remove wall or pipe, or Grease Trap. A special attachment allows water to flow from the faucet through the Gun while air is released on the pipe. Vents or stacks are no obstacle, as force tends to strike wherever the water lays. But now, what is this Plumbers Flushing Gun worth in **COSTLY PLUMBING BILLS SAVED?** Tear this Ad out—and write your name and address beside it for **FREE BOOKLET.** Obey that urge. No agent will call. A postcard will do (Chicago Phone Kildare 5-1702) **MILLER SEWER ROD CO., DEPT. PS-P, 4640 N. Central Ave., Chicago 30, Illinois.**

DO MORE PLANING JOBS WITH LOW COST BELSAW

LOW DOWN PAYMENT
EASY TERMS

Exclusive MONEY-MAKING Features: Full 12¼" x 6" capacity • Power feeds at 14' to 34' a minute • Provides for Grinding Knives in the Cutterhead • Attachments for Jointing, Rabbeting, Tongue, Matching, Groove. Convert low cost rough lumber into high priced stock. Easy to make flooring and popular patterns. Send Today for FREE Literature and Prices.

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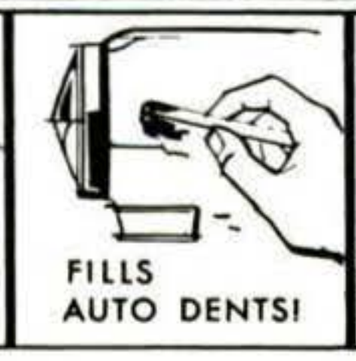
REPAIRS PLUMBING LEAKS!



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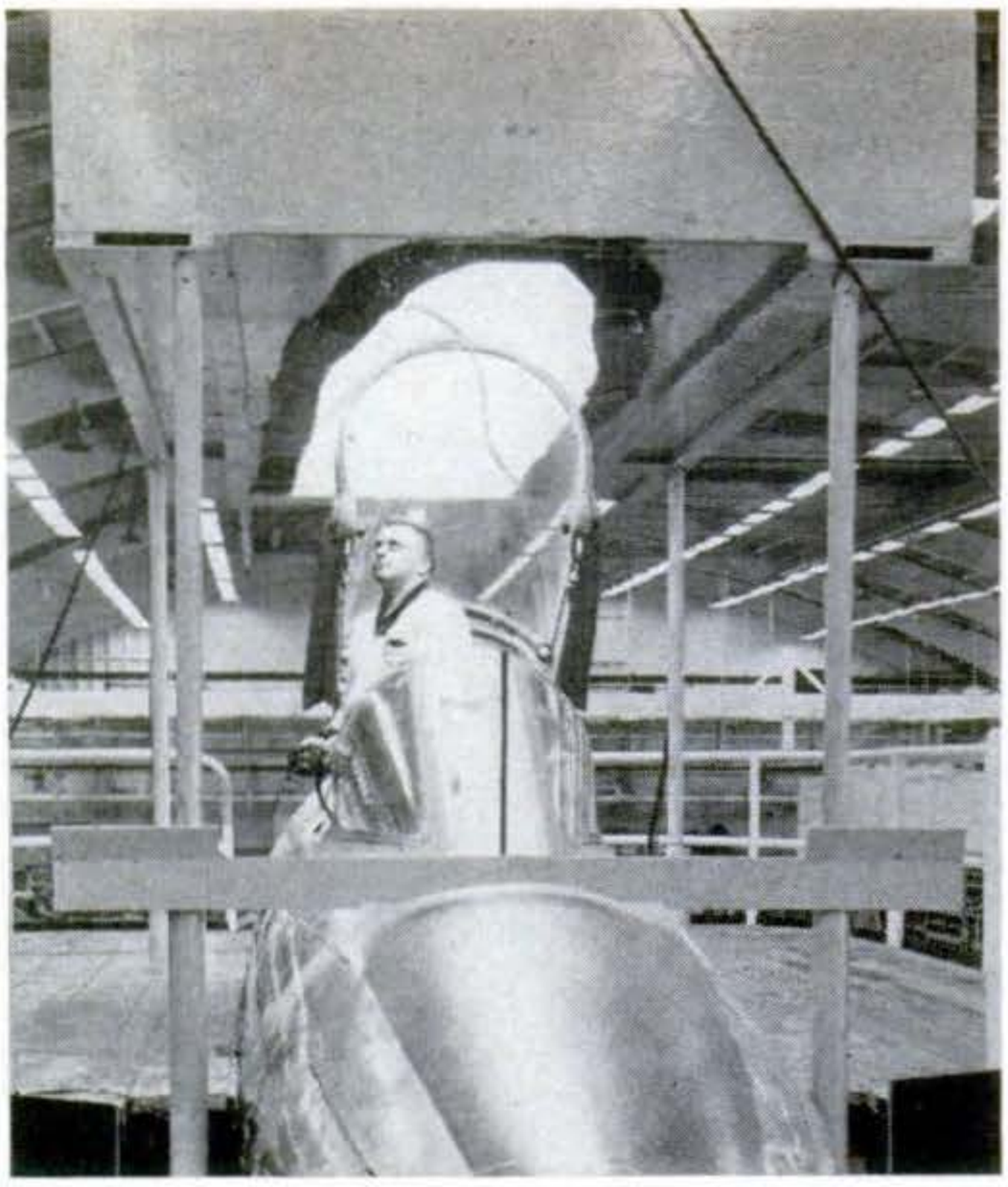
BONDS TO WOOD, METAL, CONCRETE, PLASTICS, GLASS!

Eccobond 26
Epoxy

THE "FIX-ALL" COMPOUND GUARANTEED TO WORK OR DOUBLE YOUR MONEY BACK! New epoxy adhesive & patch material developed for aircraft & missile use sticks anything to anything *forever* — or double your money back! Send $2.00 for complete kit (postpaid) to Emerson & Cuming, Inc., Canton, Mass.



Box simulates cockpit lighting

LOWERED over the cockpit of this F-105 mockup, the hood above can duplicate every light condition, from total darkness to brightest sunshine. Republic uses it to check the visibility of its controls.

Big board stars on television

CLOSED-CIRCUIT TV now flashes New York Stock Exchange prices to Wall Street brokers' offices. Here's the first one, installed by Bache & Co. One possible effect: the end of ticker-tape parades.

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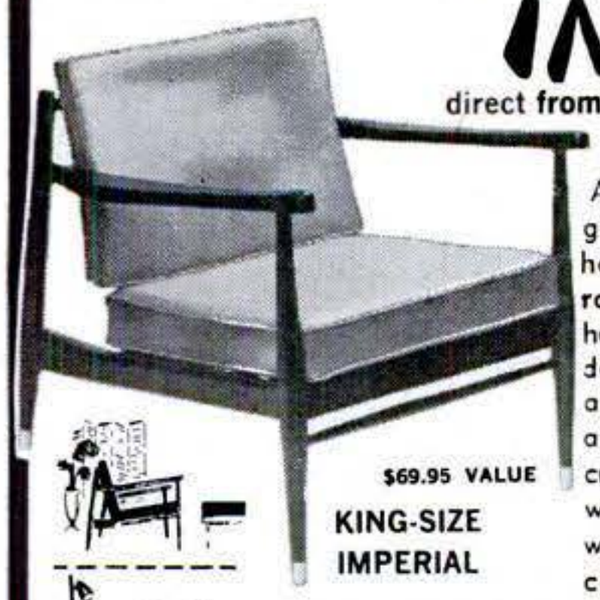
direct from the importer to you at our lower-than-wholesale prices



Authentic Danish Modern styling that gives comfort, utility, and beauty at home in your den, family room, living room, lanai, or office. "Sculptured" hardwood frame in Danish Walnut or dark Danish Oak. . . finely finished, and ready for easy do-it-yourself assembly. Cushions by American craftsmen in Luxurious Foam Rubber with Naugahyde, Naugalite, etc. . . washable covers in charcoal, pink, coral, aqua, russet, lime, white. .

$69.95 VALUE

KING-SIZE IMPERIAL

CHAIR – complete with cushions and covers **$32.50**

or if you desire to do your own upholstering . . .

CHAIR FRAME COMPLETE – ready-to-assemble with all accessories . . . $17.95
FOAM RUBBER CUSHIONS – Set of 2 (back and seat) uncovered $10.00
EXTRA COVERS with zippers. Set of 2 (back and seat). Choice of colors $7.50

Note: Specify color of covers and wood when ordering.

the Super PAL-MASTER RIFLESCOPES

for TARGET

BENCH REST or HUNTING

A rugged, precision made riflescope to fit your every need. Has positive internal type Windage & Elevation Adjustments with direct reading, click type knobs. Cross Hair Reticle remains centered at all times. Lenses are finest optical glass. All lenses are color corrected, distortion free and hard coated to meet U.S. Army standards. The Ocular lens has a precision indexed fast focus adjustment. Objective lens adjusts for finer sighting. 3/4" barrel is rust proof blued steel. Will stand recoil from the heavy caliber rifles. Mount included will fit ALL U.S. and most foreign military rifles. Weight: 6ozs. Eye Relief: 2" to 3-1/2". W/instructions.

FITS ALL U.S. RIFLES

COMPLETE WITH MOUNT

2 1/2 POWER 14.95
35 ft. field at 100 yds.

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30 ft. field at 100 yds.

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20 ft. field at 100 yds.

WHEN ORDERING SPECIFY MAKE & MODEL NUMBER OF YOUR RIFLE.

KUTANI hand-painted WALL TILES

SAVE! FOR XMAS GIFTS

Traditional Japanese artistry creates this dramatic new wall decoration. . now imported direct-to-you! Adds a glamorous note to any home. Four lustrous white tiles are mounted in an ebony black frame. Vibrantly colored scenes are hand painted and fired-on for lifetime beauty. Scenes available are: Birds, Tropical Fish, Flowers or Landscapes. Picture size: 8"x 26". A $5.95 VALUE!

$2.99 each. **$4.99** Set of 2

KUTANI SQUARE TILE PICTURES

The newest addition to this glamorous line. . Individual handpainted tile pictures. . . Ideal for wall groupings. In same scenes as above but size is 8"x 8". $4.95 Value.

$1.98 each 3 for ONLY **$3.69**

SPECIAL 60 to 450 Power MICROSCOPE

HAS 60, 120, 150, 180, 300 and 450 POWER MAGNIFICATION

With NEWLY DEVELOPED SUB-STAGE LIGHT which ELIMINATES NEED for ANY EXTERNAL LIGHT SOURCE.

Another Palley Optical Bargain. Ideal for scientific inclined Boys & Girls, Adults, Home labs, etc. Has precision ground pod polished lenses. Two interchangeable eyepieces of 6X and 15X – Triple revolving turret with 10X, 20X and 30X lenses – Patented sub-stage mirror with self-contained light for use without external light source plus large sub-stage mirror for use with external light source when desired – All metal body which inclines through 90° – Fitted wood case and 3 glass slides. Order WHILE STOCKS are COMPLETE!

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8-PIECE DISSECT SET. Has Scalpel, Scissors, 6 Slides, Tweezers, Magnifying Glass, etc. 12.95

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20 Power 40mm

Imported directly by us! Full 20 POWER magnification yet small enough to fit your pack gear easily. Precision ground lenses & prisms. Fully coated objective lens. Adjustable eye-piece. Comes with sturdy tripod & leatherette case with zipper. Overall length 8¼", weighs 15 ozs.

150-600 POWER MICROSCOPE

NEW IMPORT

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IDEAL for UNIVERSITY or PRE-MED USE – Has a triple revolving turret with 10X, 20X and 40X ground, polished micromatic objective lenses. 15X eyepiece gives up to 600 power magnification. Has a chromatic, built-in condenser illuminator. Two-sided plano-concave substage mirror. Rugged all metal body. 1 year guarantee. In fitted case.

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12 SLIDES FREE! INCLUDE INSECTS-SPORES-POLLEN-ETC.

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9-IN-1

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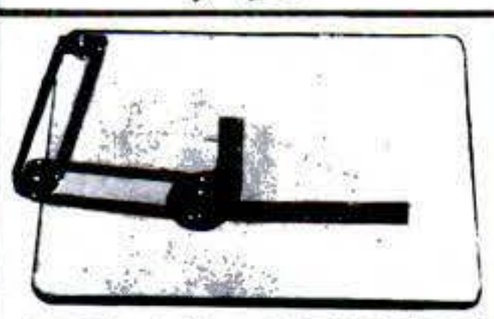
9 practical tools in ONE! A Jack Knife, Scissors, Saw, Can Opener, Screwdriver (Phillips), Awl, Bottle Opener, regular Screwdriver & Paring Knife. Finest, rugged steel blades. Easy to open.

100 - 200 - 300X SAVE MICROSCOPE BUY NOW!

Perfect GIFT for STUDENT – AMATEUR SCIENTIST

Has fine precision ground and polished lenses. Triple revolving objective lens turret allows choice of 100X, 200X or 300X magnification. Has right and left hand rack & pinion adjustment. All-metal body inclines through 90°. Has sub-stage mirror and comes in fitted wood case. An ideal GIFT for the Science Student. . . Originally sold for $14.95, NOW. . . 7.88



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Professional type, scientifically designed Drafting Machine. Ideal for use in the Office, Classroom, Art Studio, Workshop, Home, etc. SMALL ENOUGH TO FIT IN YOUR BRIEFCASE! Made of black anodized aluminum with sharp white markings. Comes with 11"x 17" drawing board. Weighs only 2½ pounds. 6.95

4 inch IMPORTED SLIDE RULE

Non-warping bamboo with scales on a white nitrate face. Face scales are A, B, C1, C, D and K. Other side has S, L & T scales. In Case. 2.95

5 inch IMPORTED SLIDE RULE – Same scales as above rule . . . 3.59

10 inch LOG-LOG DECIMAL TRIG IMPORTED SLIDE RULE

Professional Log-Log, Decimal Trig Slide Rule. Non-warping top quality bamboo – 2-color scales on white nitrate facing. Scales are L, LL1, DF, CF, CIF, C1, C, D, LL3 & LL2 on one side. Other side LL0, LL00, A, B, K, CI, C, D, S, ST & T. With cursor and 16 pg. book. . 10.95

2-IN-1 GARDEN & PAINT SPRAYER

JUST PUSH THE LEVER AND PAINT ROLLS ON!

PAINT Walls, Ceilings, Roof, etc. – SPRAY Insects and Garden Pests. Includes Pressure Roller & Spray Nozzle! Just pump-up tank and spray insecticide, paint, etc. or attach roller to roll-on paint. Has 3 gal. capacity with a 32" hose & squeeze type release. Adjustable for fine or coarse spray. A $39.00 VALUE for Only 16.88

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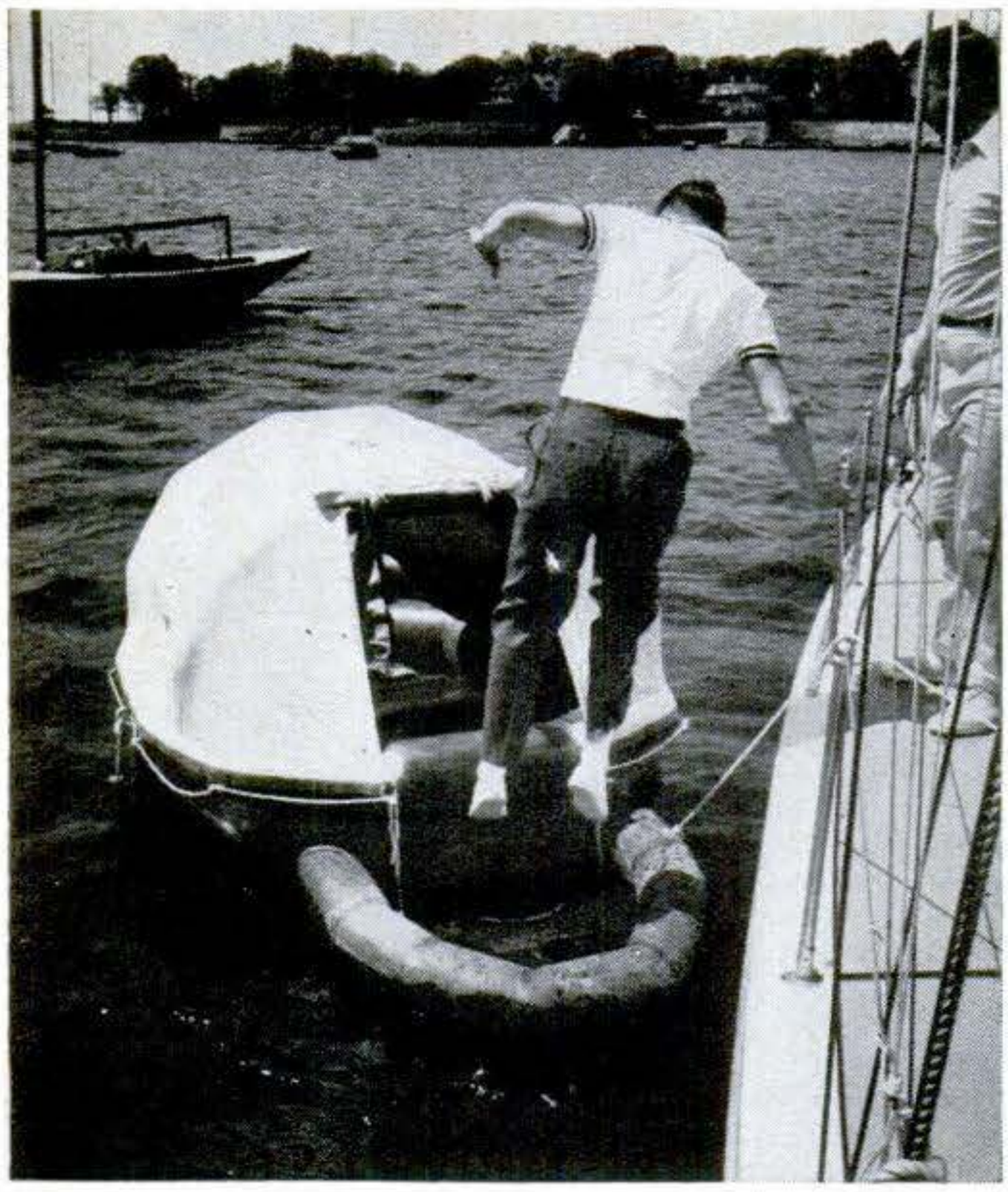
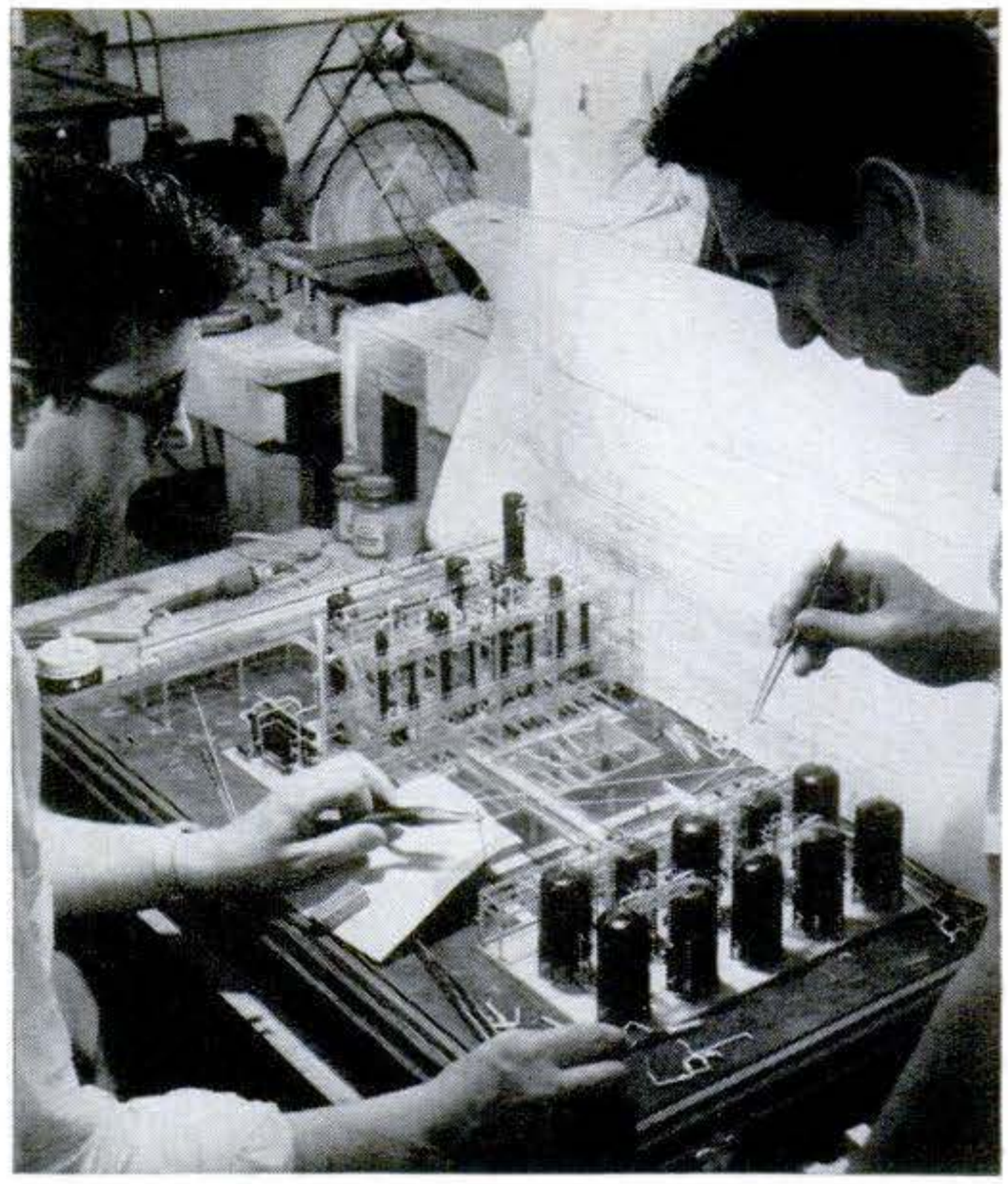


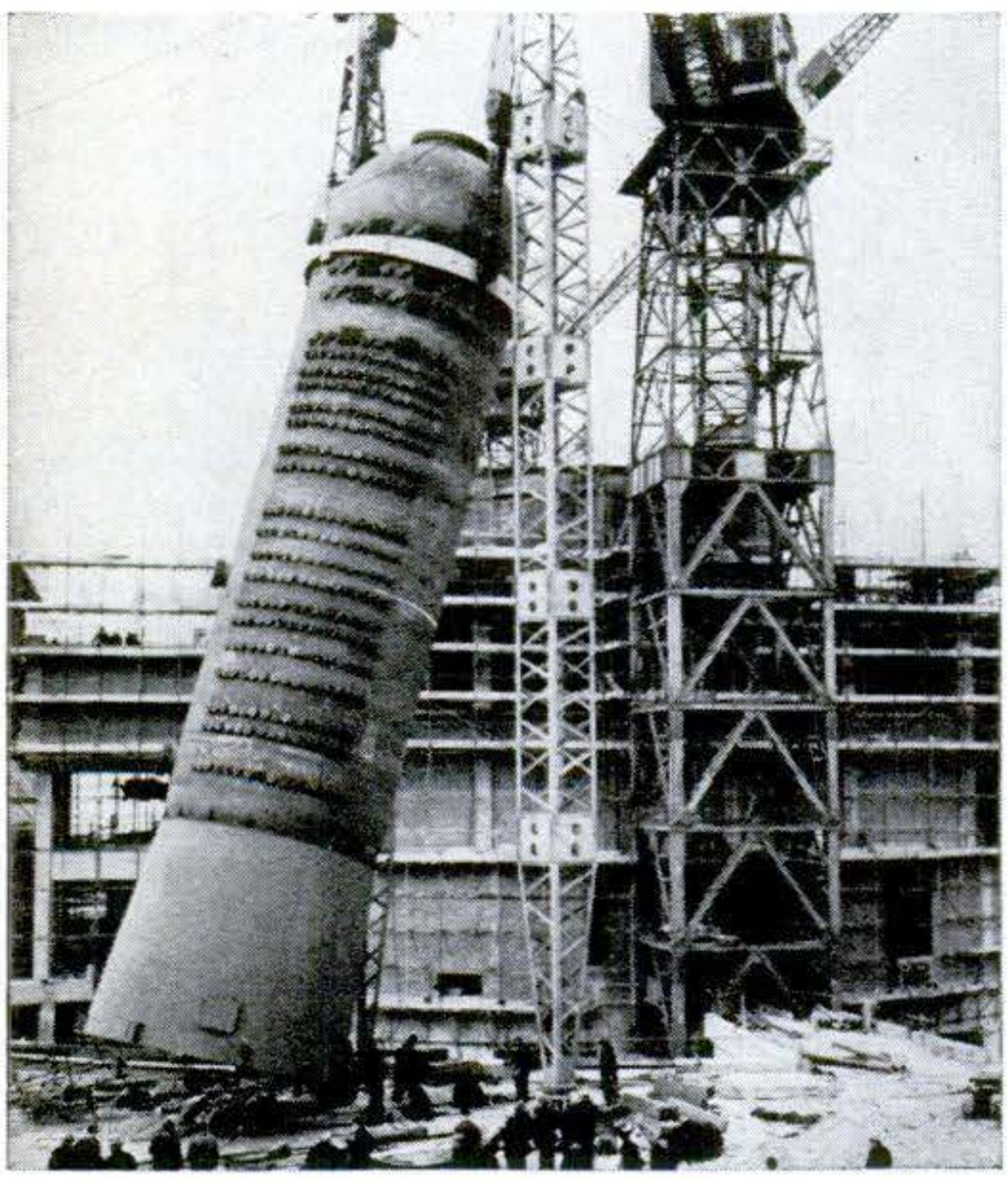
Raft has leap-on platform

THIS new self-inflating raft opens in the water in 30 seconds, complete with a boarding platform which can be jumped on from a boat deck. It is made by U. S. Rubber, holds 10 persons and equipment.



Model irons out kinks

UNION CARBIDE builds new plants and production units for a few thousand dollars in this model shop before risking fortunes on the real thing. It shows up blueprint flaws, say the designers.



Tower readied for A-power

THE first of 16 giant heat exchangers is placed in position at the Berkeley nuclear power station, nearing completion in England. The tower, 70 feet high and 17½ feet in diameter, weighs 133 tons.

Platform cuts airdrop shock

LUMBER, plywood and paperboard honeycomb, put together in the field, form this shock-absorbing platform being tested by the Army for combat airdrops. The jeep landed by parachute unscratched.

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Announcing the United States Army's Graduate Specialist Program 1958 ~ 1959

The Purpose: This program is offered to provide qualified high school graduates with the technical schooling which will enable them to join the Army's key group of specialists, its select team of experts in every field from electronics to rocketry and guided missiles.

The Program: This plan offers young men their choice of 107 technical training courses—young women, their choice of 26. These courses are conducted at special Army schools which utilize the most modern technical facilities and equipment available. All instructors are experts in their fields. Completion of schooling qualifies young men and women as skilled specialists—ready to begin careers in their chosen specialties.

The Qualifications: To qualify as a Graduate Specialist, you must pass certain qualification and aptitude tests and be a high school graduate. However, you may apply while you are still in your senior year and, if qualified, enter the program after graduation. It is advisable to apply early, since quotas for each course are limited and qualified applicants are selected on a first-come-first-served basis.

The Procedure: To apply for the Graduate Specialist Program, visit your local Army Recruiting Station. Your Army Recruiter will give you an enlistment screening test. After passing this initial qualification test, you will be interviewed by the Recruiter who is an experienced counselor. He will discuss your academic background and interests with you. Based on your own abilities and desires, he will help you select a first choice course and two alternates. If quotas for your first choice course are filled, you may still become a Graduate Specialist in one of your selected alternates. Your Army Recruiter will then forward your application for processing. You will later receive a formal letter notifying you that a place in a course of your choice is waiting for you. Not until after high school graduation and shortly before your course begins will you actually enlist, and then only for three years. Before enlistment, you will take two final tests, the Armed Forces Qualification Test and the Army Qualification Battery. After making qualifying scores in these tests relating to your particular chosen field, you are ready to enlist as an Army Graduate Specialist.

The Benefits: Through this unique program, today's Army offers qualified high school graduates an outstanding educational opportunity—a tremendous headstart toward a successful specialist's career—as well as the chance to join the Army's select group of key personnel.

Get choice, not chance, in Today's Army

Choose Your Graduate Specialist Schooling From 107 Courses Like These

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- Radar Repair
- Microwave Radio Equipment Repair
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- Engineer Equipment and Maintenance
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- ☐ Creative Salesmanship
- ☐ Managing a Small Business
- ☐ Professional Secretary
- ☐ Public Accounting
- ☐ Purchasing Agent
- ☐ Salesmanship
- ☐ Salesmanship and Management
- ☐ Traffic Management

CHEMICAL
- ☐ Analytical Chemistry
- ☐ Chemical Engineering
- ☐ Chem. Lab. Technician
- ☐ Elements of Nuclear Energy
- ☐ General Chemistry
- ☐ Natural Gas Prod. and Trans.
- ☐ Petroleum Prod. and Engr.
- ☐ Professional Engineer (Chem)
- ☐ Pulp and Paper Making

CIVIL ENGINEERING
- ☐ Civil Engineering
- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Professional Engineer (Civil)
- ☐ Reading Struc. Blueprints
- ☐ Structural Engineering
- ☐ Surveying and Mapping

DRAFTING
- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Drafting Machine Design
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Sheet Metal Drafting
- ☐ Structural Drafting

ELECTRICAL
- ☐ Electrical Engineering
- ☐ Elec. Engr. Technician
- ☐ Elec. Light and Power
- ☐ Practical Electrician
- ☐ Practical Lineman
- ☐ Professional Engineer (Elec)

HIGH SCHOOL
- ☐ High School Diploma
- ☐ Good English
- ☐ High School Mathematics
- ☐ Short Story Writing

LEADERSHIP
- ☐ Industrial Foremanship
- ☐ Industrial Supervision
- ☐ Personnel-Labor Relations
- ☐ Supervision

MECHANICAL and SHOP
- ☐ Diesel Engines
- ☐ Gas-Elec. Welding
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Metallurgy
- ☐ Industrial Safety
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Professional Engineer (Mech)
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration and Air Conditioning
- ☐ Tool Design ☐ Tool Making

RADIO, TELEVISION
- ☐ General Electronics Tech.
- ☐ Industrial Electronics
- ☐ Practical Radio-TV Eng'r'g
- ☐ Practical Telephony
- ☐ Radio-TV Servicing

RAILROAD
- ☐ Car Inspector and Air Brake
- ☐ Diesel Electrician
- ☐ Diesel Engr. and Fireman
- ☐ Diesel Locomotive

STEAM and DIESEL POWER
- ☐ Combustion Engineering
- ☐ Power Plant Engineer
- ☐ Stationary Diesel Engr.
- ☐ Stationary Fireman

TEXTILE
- ☐ Carding and Spinning
- ☐ Cotton Manufacture
- ☐ Cotton Warping and Weaving
- ☐ Loom Fixing Technician
- ☐ Textile Designing
- ☐ Textile Finishing & Dyeing
- ☐ Throwing
- ☐ Warping and Weaving
- ☐ Worsted Manufacturing

Name_____ Age_____ Home Address_____

City_____ Zone_____ State_____ Working Hours_____ A.M. to P.M._____

Occupation_____

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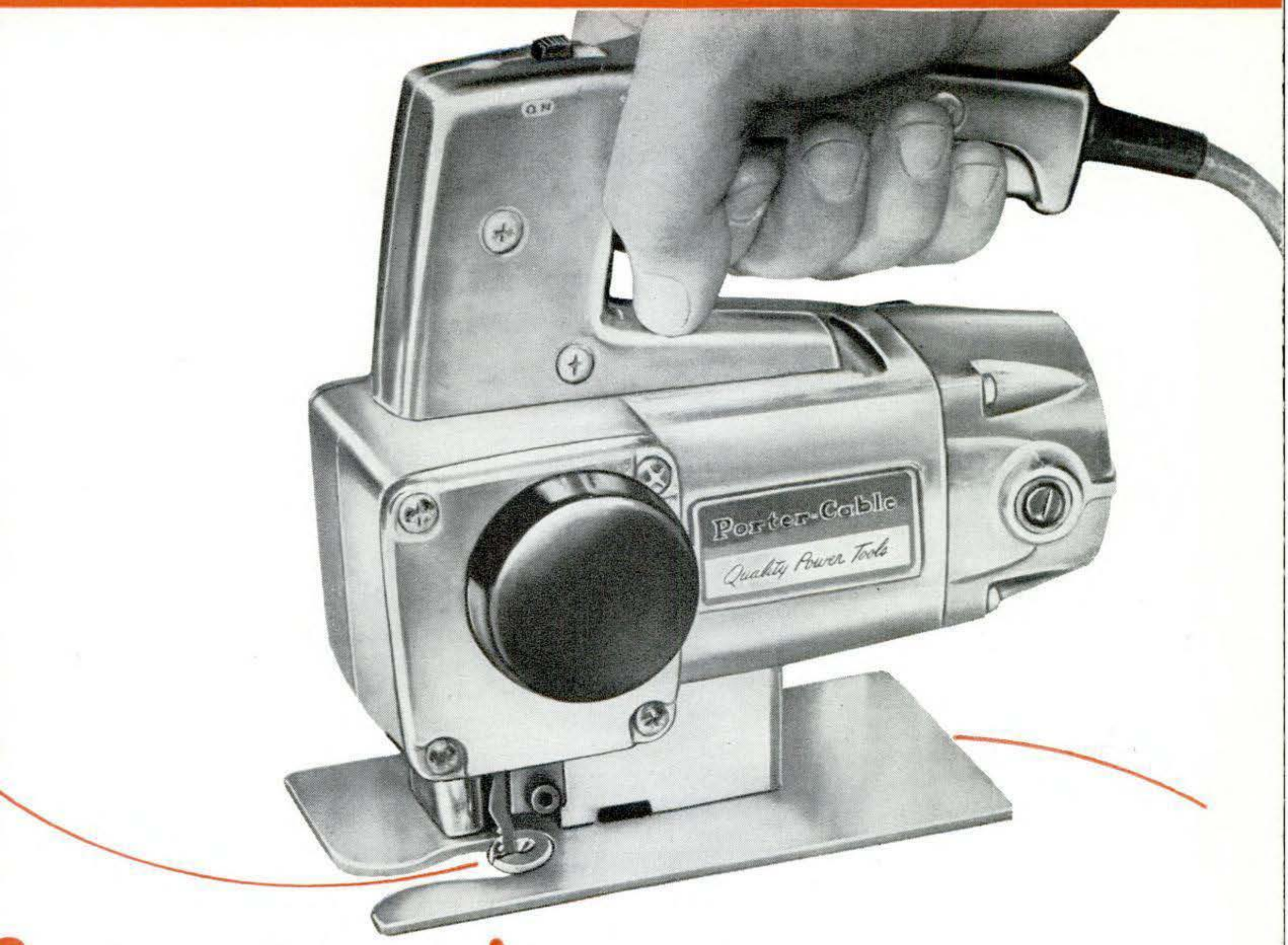
THE FINEST ALL-PURPOSE

PORTER-CABLE'S ELECTRIC H



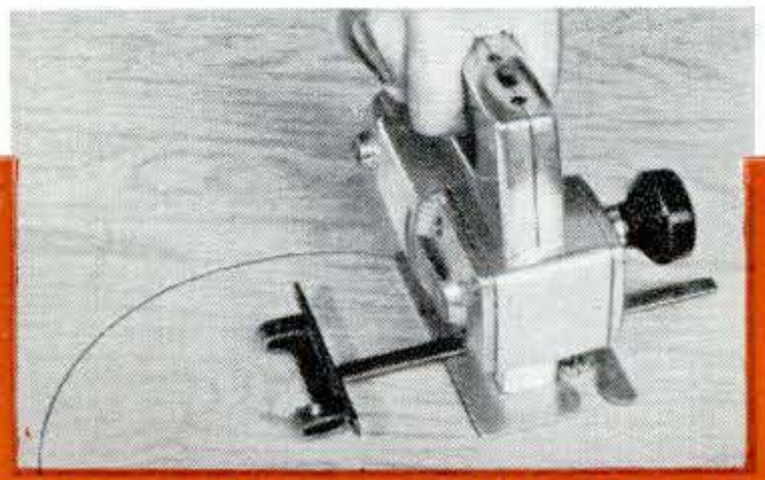
Seven saws in one

...cuts with hairline accuracy

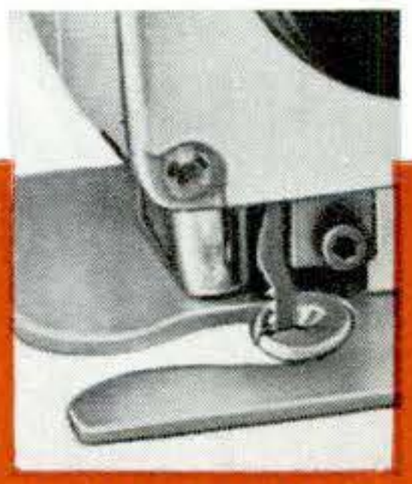
Fast becoming the most essential tool in the home workshop. Actually a rip saw, cross-cut, coping, keyhole, scroll, jig and hacksaw. And the Porter-Cable hand saw assures you of a precise cut in every application because of these exclusive design features: top handle with on-off switch for positive control; auxiliary side handle for two-handed control in awkward positions and on intricate cuts; king-size base for stability; and a sawdust blower to keep the cutting line clear. For hundreds of jobs, this saw has no equal. Order yours today.

Slices 2x4's in 8 seconds flat! Metal, too – 1/4" aluminum, 1/8" steel! Cuts sheet metal, bar stock, pipe, and rods, laminated plastics, and compositions.

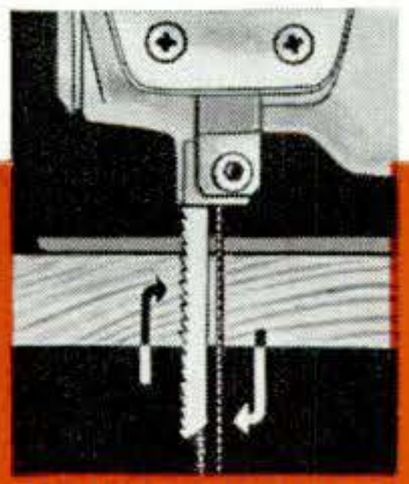
Cuts accurate angles up to 45° with exclusive angle base. The 152 saw makes inside cuts without drilling a starting hole and without blade breakage.



Cuts perfect circles quickly with guide attachment. Beginning with a plunge cut, the Porter-Cable 152 saw easily and accurately makes a cut-out in the center of a panel of almost any material. Scrollwork, ripping, cross-cutting, and contour cutting are made with professional results.



Saws plywood and laminates without shredding or chipping, thanks to exclusive insert disc. Standard with every 152 saw, it's typical of P-C design.



Orbital Action-blade cuts 3 times faster, lasts up to 30 times longer. Blade moves forward only on cutting stroke—pulls back on non-cutting stroke.

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"Hottest" fishing news for '59!

From the torrid heat of Corpus Christi, Texas, to the frigid waters of Sitka, Alaska, commercial fishermen put 98 Evinrude test engines through the wringer of practical day-in, day-out work boat use. Behind the scenes, Evinrude engineers ran controlled performance tests in 40° water.

Tests proved all around superiority of Evinrude's new '59 "hot running" thermostat-controlled motors over standard engines. Now all 1959 Evinrudes from 5½ to 50 hp are thermostat-controlled and operate at a constant 140° temperature for peak efficiency at all speeds, all conditions.

Longer Spark Plug Life

In all motors tested, spark plugs lasted 3 to 7 times longer in the thermostat-controlled engines—dramatic evidence of the benefits of faster warm-up, unvarying temperature, and better lubrication.

Smoother Operation

Whether in icy waters in the North, or warm Southern waters, thermostat control gives the new '59 Evinrudes better idling, smoother full-range performance, permits closer engineering tolerances.

Extra Fuel Savings

Under identical operating conditions the thermostat-controlled motors used up to 20% less fuel—a practical demonstration of increased efficiency.

Less Rust and Salt Corrosion

The problems of salt corrosion or rust in bearings or cylinders caused by high humidity are licked by warmer, drier air under the covers.

Longer Engine Life

The 98 Evinrudes tested on the job by commercial fishermen were all run from 1500 to 1800 hours without major maintenance. Many of these fishermen were so impressed they wanted to buy the motor they had been trying to wear out. Longer engine life is a real economy for any fisherman.

The '59 Evinrudes are no "warmed-over" last year's models. They're new hot-blooded thermostat-controlled motors with increased performance.

See '59's finest motors at your Evinrude dealer (listed under "outboard motors" in your phone book). Ask for '59 catalog—or write: Evinrude Motors, 4362 North 27th Street, Milwaukee 16, Wisconsin.

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EVINRUDE

QUIET OUTBOARD MOTORS

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